MATHS

BOOKS - ARIHANT MATHS (HINGLISH)

DIFFERENTIAL EQUATIONS

ILLUSTRATIVE (EXAMPLES)

1. Write the degree of the differential equation $x^3\left(\frac{d^2y}{dx^2}\right)^2+x\left(\frac{dy}{dx}\right)^4=0.$

A.

B.

C.

D.

Answer: Degree $= 2$

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2. What is the degree of the following equations ?

$$\left(\frac{dy}{dx}\right)^4 - 3x\frac{d^2y}{dx^2} = 0$$

A.

B.

C.

D.

Answer: Degree $= 1.$

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3. What is the degree of the following differential equation?

$$5x\left(\frac{dy}{dx}\right)^2 - \frac{d^2y}{dx^2} - 6y = \log x$$

A.

B.

C.

D.

Answer: Degree $= 1$

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4. Find the order and degree (if defined) of each of the following equations :

$y'' + 3y' + 2y = 0$

A.

B.

C.

D.

Answer: Its order is 2 and degree is 1.

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5. Find the order and degree (if defined) of each of the following equations :

$y''' + 2(y'')^2 - y' + y = 0$

A.

B.

C.

D.

Answer: Its order is 3 and degree 1.

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6. Find the order and degree (if defined) of each of the following equations :

$y'^2 - \sin^2 y = 0$

A.

B.

C.

D.

Answer: Its order is 1 and degree is 2.

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7. Find the order and degree (if defined) of each of the following equations :

$(y'')^2 + \cos y' = 0.$

A.

B.

C.

D.

Answer: Its order is 2 and degree is not defined.

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8. Determine the order and degree of each of the following differential equation. State also whether they are linear or non-linear: $\frac{s^2 d^2 t}{ds^2} + st\frac{dt}{ds} = s$

A.

B.

C.

D.

Answer: Here order = 2 and degree = 1 .

The differential equation is non-linear.

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9. Determine the order and degree or each of the following. Also, state whether they are linear or non-linear:

$$x\frac{dy}{dx}+\frac{3}{\frac{dy}{dx}}=y^2$$

A.

B.

C.

D.

Answer: Here order = 1 and degree = 2 .
The differential equation is non-linear.

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10. Determine the order and degree of each of the following differential equation. State also whether they are linear or non-linear:

$y = px + \sqrt{a^2p^2 + b^2}, \ where \ p = \frac{dy}{dx}$

A.

B.

C.

D.

Answer: Here order = 1 and degree = 2 .

The differential equation is non-linear.

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11. Determine the order and degree or each of the following. Also, state whether they are linear or non-linear:

$\frac{d^2y}{dx^2} = \cos 3x + \sin 3x.$

A.

B.

C.

D.

Answer: Here order = 2 and degree = 1 .

The differential equation is linear.

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12. Writhe the order and degree of the differential equation

$$y = x\frac{dy}{dx} + a\sqrt{1 + \left(\frac{dy}{dx}\right)^2}.$$

A.

B.

C.

D.

Answer: Here order = 1 and degree = 2 .

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13. Verify that the given functions (explicit or implicit) is a solution of the corresponding differential equation: $y = x^2 + 2x + C$: $y' - 2x - 2 = 0$

A.

B.

C.

D.

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14. Verify that the given function (explicit of implicit) is a solution of the corresponding differential equation :

(ii) $x + y = \tan^{-1} y, y^2 y' + y^2 + 1 = 0.$

A.

B.

C.

D.

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15. For each of the following differential equations, verify that the accompanying functions is a solution (both the differential equations and the accompanying functions being on whole of R) :

(i) $y' = e^x : e^x$

(ii) $(1+x^2)y' = xy: \sqrt{1+x^2}$.

A.

B.

C.

D.

Watch Video Solution

16. For each of the following differential equations, verify that the accompanying function is a solution in the domain mentioned ($A, B \in R$: parameters)

(i) $xy' = y(x \in R \backslash \{0\}) : Ax(x \in R \backslash \{0\})$

(ii) $x^3 y'' = 1(x \in R \backslash \{0\}) : \frac{1}{2x} + Ax + B(x \in R \backslash \{0\})$.

A.

B.

C.

D.

Watch Video Solution

17. If $y = 3\cos(\log x) + 4\sin(\log x)$, then show that

$x^2 \frac{d^2 y}{dx^2} + \frac{dy}{dx} + y = 0$

A.

B.

C.

D.

Watch Video Solution

18. Verify that the function $y = e^{-3x}$ is a solution of the differential equation $\frac{d^2y}{dx^2} + \frac{dy}{dx} - 6y = 0$

A.

B.

C.

D.

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19. Show that the function $y = (A + Bx)e^{3x}$ is a solution of the equation $\frac{d^2y}{dx^2} - 6\frac{dy}{dx} + 9y = 0$.

A.

B.

C.

D.

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20. Verify that the function $y = c_1 eax \cos bx + c_2 eax \sin bx$, where c_1, c_2 are arbitrary constants is a solution of the differential equation. $\frac{d^2y}{dx^2} - 2a\frac{dy}{dx} + (a^2 + b^2)y = 0$

A.

B.

C.

D.

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21. Solve the following differential equation: $\left(1+x^2\right)\frac{dy}{dx}-x=2\tan^{-1}x$

A.

B.

C.

D.

Watch Video Solution

22. Find the general solution of the differential equation :

$$\left(\tan^2 x + 2\tan x + 5\right)\frac{dy}{dx} = 2(1 + \tan x)\sec^2 x.$$

A.

B.

C.

D.

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23. The marginal cost of manufacturing a certain item is given by

$C'(x) = 2 + 0 \cdot 15x.$

Find the total cost function C(x), given that $C(0) = 100.$

A.

B.

C.

D.

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24. Assume that a spherical rain drop evaporates at a rate proportional to its surfaceradius originally is 3 mm and 1 hour later has been reduced to 2 mm, find an expression for the radius of the rain drop at any time.

A.

B.

C.

D.

Answer: $k = 1$

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25. Solve the following differential equation: $\frac{dy}{dx} \frac{1+y^2}{y^3}$

A.

B.

C.

D.

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26. Solve: $\frac{dy}{dx} = \sec y$

A.

B.

C.

D.

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27. Solve $\frac{dy}{dx} = \cos(x+y)$

A.

B.

C.

D.

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28. Find the particular solution of $\frac{dy}{dx} = \cos(x+y+1)$, given that $x = 0, y = -1$.

A.

B.

C.

D.

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29. The x-intercept of the tangent to a curve is equal to the ordinate of the point of contact. The equation of the curve through the point (1,1) is

A.

B.

C.

D.

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30. Find the equation of the cure which passes through the point (3,-4) and has the slope $\frac{2y}{x}$ at any point (x, y) on it.

A.

B.

C.

D.

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31. Suppose the growth of a population is proportional to the number present. If the population of a colony dubles in 50 months, in how many months will the population become triple ?

A.

B.

C.

D.

Answer: Hence, the population becomes triple in $50\frac{\log 3}{\log 2}$ months.

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32. If is given that radium decomposes at a rate proportional to the amount present. If $p\%$ of th original amount of radium disappears in l years, what percentageof it will remain after $2l$ years?

A.

B.

C.

D.

Answer: $\left(10-\frac{p}{10}\right)^2$.

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33. If is known that, if the interest i s compounded continuously, the principal changes f the rate equal to the product of the rate of bak interest per annum, and the principal. If the interest is compounded continuously at 5% per annum, in how many years will Rs. 100 double itself? At what interest rate will Rs. 100 double itself in 10 years $\left((\log)_e 2 = 0.6931\right)$ How much will Rs. 1000 be worth at 5% interest after 10 years? $\left(e^{0.5} = 1.648\right)$.

A.

B.

C.

D.

Answer: Hence, the principal doubles in $20\log_e 2$ years.

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34. A radioactive substance disintegrates at as rate proportional to the amount of substance present. If 50% f the given amount disintegrates in 1600 years. What percentage of the substance disintegrates i 10 years ? $\frac{-\log 2}{160} Takee = 0.9957$

A.

B.

C.

D.

Answer: $0 \cdot 43\ \%$ **of the original amount of substance.**

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35. The doctor took the temperature of a dead body at 11.30 Pm which was $94.6^{0}F$. He took the temperature of the body again after one hour, which was $93.4^{0}F$. If the temperature of the room was $70^{0}F$, estimate the time of death. Taking normal temperature of human body as $98.6^0 F$.

[Given: $\frac{\log(143)}{123} = 0.15066, \frac{\log(123)}{117} = 0.05$]

A.

B.

C.

D.

Answer: Hence, the estimated time of death $= 11 \cdot 30 - 3 \cdot 01 = 8 \cdot 30$ **P.M. approx.**

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36. The equation of the curve in which the portion of the tangent included between the coordinate axes is bisected at the point of contact, is

A.

B.

C.

D.

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37. The velocity v of mass m of a rocket at time t is given by the equation :

$$m\frac{dv}{dt} + V\frac{dm}{dt} = 0,$$

where 'V' is the constant velocity of emission. If the rocket starts from rest when $t = 0$ with mass m, prove that :

$$v = V \log\left(\frac{m_0}{m}\right).$$

A.

B.

C.

D.

Answer: $v = V \log\left(\frac{m_0}{m}\right).$

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Frequently Asked Questions

1. Write the differential equation representing the family of curves $y = mx$, where m is an arbitrary constant.

A.

B.

C.

D.

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2. Find the differential equation of the family of all straight lines passing through the origin.

A.

B.

C.

D.

Watch Video Solution

3. Show that the function $y = A\cos 2x + B\sin 2x$ is a solution of the differential equation $\frac{d^2y}{dx^2} + 4y = 0$

A.

B.

C.

D.

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4. Find the differential equation representing the family of curves $y = ae^{bx+5}$, where a and b are arbitrary constants

A.

B.

C.

D.

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5. Find the differential equation of the family of curves :

$y = Ae^{2x} + Be^{3x}$.

A.

B.

C.

D.

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6. Find the differential equation of the family of circles $(x-a)^2+(y-b)^2=r^2$, where 'a' and 'b' are arbitrary constants.

A.

B.

C.

D.

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7. Form the differential equation of the family of circles touching the x-axis at origin.

A.

B.

C.

D.

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8. Form the differential equation representing the family of parabolas having vertex at origin and axis along positive direction of x-axis.

A.

B.

C.

D.

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9. Form the differential equation of the family of ellipses having foci on y-axis and centre at origin.

A.

B.

C.

D.

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10. A saving account pays 6% interest per year, compounded continuously. In addition, the income from another investment is credited to the account continuously at the rate Rs. 4,000 per year. From the differential equation to model this account.

A.

B.

C.

D.

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11. A spherical rain drop evaporates at a rate proportional to its surface area at any instant t. The differential equation giving the rate of change of the radius of the rain drop is _____

A.

B.

C.

D.

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12. $\frac{dy}{dx}=\frac{1+y^2}{1+x^2}$

A.

B.

C.

D.

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13. Solve the differential equation

$(1+x)(1+y^2)dx+(1+y)(1+x^2)dy=0.$

A.

B.

C.

D.

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14. (a) Solve :(i) $\frac{dy}{dx} = 1 + x + y + xy$

(ii) $xyy' = 1 + x + y + xy$.

A.

B.

C.

D.

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15. Find the particular solution of the differential equation $\frac{dy}{dx} = 1 + x + y + xy$, given that y = 0 when x = 1.

A.

B.

C.

D.

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16. $\sqrt{1+x^2+y^2+x^2y^2}+xy\frac{dy}{dx}=0$

A.

B.

C.

D.

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17. Solve the following initial value problems and find the corresponding solution curves :

$(i) 2xy' = 5y, y(1) = 1$

(ii) $\sin x \cos y dx + \cos x \sin y dy = 0, y(0) = \frac{\pi}{4}$.

A.

B.

C.

D.

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18. find the particular solution satisfying the given condition, for the following differential equation: $(x+1)\frac{dy}{dx} = 2e^{-y} - 1$ given that $y = 0$ when $x = 0$

A.

B.

C.

D.

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19. Solve each of the following differential equations

$\cos y dx + (1 + 2e^{-x})\sin y dy = 0.$

A.

B.

C.

D.

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20. Find the particular solution of the differential equation $e^x \tan y dx + (2 - e^x)\sec^2 y dy = 0,$ given that $y = \frac{\pi}{4}$ when $x = 0.$

A.

B.

C.

D.

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21. Find the particular solution of the differential equation $(1 - y^2)(1 + \log x)dx + 2xydy = 0$ given that $y = 0$ when $x = 1$

A.

B.

C.

D.

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22. Find the particular solution of the differential equation $\frac{\log(dy)}{dx} = 3x + 4y$ given that $y = 0$ when $x = 0$.

A.

B.

C.

D.

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23. Show that the differential equation $\frac{dy}{dx} = \frac{y - x}{y + x}$ is homogenous and solve it.

A.

B.

C.

D.

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24. $\left(x^2 + xy\right)dy = \left(x^2 + y^2\right)dx$

A.

B.

C.

D.

Watch Video Solution

25. Show that the differential equation $(x^2 + xy)dy = (x^2 + y^2)dx$ is homogenous and solve it.

A.

B.

C.

D.

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26. Solve : $\dfrac{dy}{dx} = \dfrac{y^3 + 2x^2y}{x^3 + 2xy^2}$.

A.

B.

C.

D.

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27. An equation of the curve satisfying $xdy - ydx = \sqrt{x^2 - y^2}dx$ and y(1) = 0 is

A.

B.

C.

D.

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28. Solve : $\left(x\cos.\frac{y}{x}\right)(ydx + xdy) = \left(y\sin.\frac{y}{x}\right)(xdy - ydx)$.

A.

B.

C.

D.

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29. The differential equations , find the particular solution satisfying the given condition: (x + y) dy + (x y) dx = 0; y = 1 when x = 1

A.

B.

C.

D.

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30. Solve the following differential equation: $xy\log\left(\frac{x}{y}\right)dx + \left\{y^2 - x^2\log\left(\frac{x}{y}\right)\right\} = 0$

A.

B.

C.

D.

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31. Solve the following differential equation: $x\frac{dy}{dx} - y + x\sin\left(\frac{y}{x}\right) = 0$

A.

B.

C.

D.

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32. Prove that $x^2 - y^2 = c(x^2 + y^2)^2$ is the general solution of differential equation $(x^3 - 2xy^2)dx = (y^3 - 3x^2y)dy$, where c is a parameter.

A.

B.

C.

D.

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33. Solve $2ye^{x/y}dx + \left(y - 2xe^{x/y}\right)dy = 0$

A.

B.

C.

D.

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34. $(x \log x)\frac{dy}{dx} + y = 2\log x$

A.

B.

C.

D.

Answer: $\log x$

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35. Solve the differential equation : $x\frac{dy}{dx} + 3y = \frac{\log x}{x^3}$.

A.

B.

C.

D.

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36. Find the general solution of the differential equations: $x\frac{dx}{dy} + y - x + xy\cot x = 0(x \neq 0)$

A.

B.

C.

D.

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37. $xdy + (y - x^3)dx = 0$

A.

B.

C.

D.

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38. $\sec x \frac{dy}{dx} - y = \sin x$

A.

B.

C.

D.

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39. Solve the following differential equations: $(2x - 10y^3)\frac{dy}{dx} + y = 0$

A.

B.

C.

D.

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40. The solution of differential equation

$(1 + y^2) + \left(x - e^{\tan^{-1} y}\right)\frac{dy}{dx} = 0$, is

A.

B.

C.

D.

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41. Solve the differential equation $\left(\tan^{-1}y - x\right)dy = \left(1 + y^2\right)dx$.

A.

B.

C.

D.

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42. (ii) Find the particular solution of DE $(1+y^2)dx + (1+x^2)dy = 0$ when $x = 0, y = 0$

A.

B.

C.

D.

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43. Solve the differential equation

$$(\cos^2 x)\frac{dy}{dx} + y = \tan x\left(0 \leq x < \frac{\pi}{2}\right)$$

A.

B.

C.

D.

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44. Find the particular solution of the differential equation $\frac{dy}{dx} + y \cot x = 2x + x^2 \cot x (x \neq 0)$given that $y = 0$when $x = \frac{\pi}{2}$.

A.

B.

C.

D.

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45. Solve: $(1 + x^2) \frac{dy}{dx} + 2x6 - 4x^2 = 0$ subject to the initial condition $y(0) = 0$.

A.

B.

C.

D.

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46. Find the general solution of the differential equation :

$$\frac{dx}{dy} = \frac{y\tan y - x\tan y - xy}{y\tan y}.$$

A.

B.

C.

D.

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Questions From NCERT Exemplar (Example)

1. The differential equation of all non-horizontal lines in a plane is (a) $(b)(c)(d)\frac{(e)(f)d^{(g)2(h)}(i)y}{j}\left((k)d(l)x^{(m)2(n)}(o)\right)(p)(q)(r)$ (s) (b) $(t)(u)(v)\frac{(w)(x)d^{(y)2(z)}(aa)x}{bb}\left((cc)d(dd)y^{(ee)2(ff)}(gg)\right)(hh)(ii) = 0(jj)$ (kk) (c) $(d)(e)(f)\frac{(g)dy}{h}((i)dx)(j)(k) = 0(l)$ (m) (d) $(n)(o)(p)\frac{(q)dx}{r}((s)dy)(t)(u) = 0(v)$ (w)

A.

B.

C.

D.

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2. The equation of the curve passing through the point $\left(1, \frac{\pi}{4}\right)$ and having a slope of tangent at any point (x,y) as $\frac{y}{x} - \cos^2\left(\frac{y}{x}\right)$ is

A.

B.

C.

D.

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3. Solve the following differential equation $x^2\frac{dy}{dx} - xy = 1 + \cos\left(\frac{y}{x}\right), x \neq 0$

A.

B.

C.

D.

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EXERCISE 9 (a) Short Answer Type Questions

1. Indicate the order of each of the following differential equations :

$$\log\left(\frac{d^2y}{dx^2}\right) = \left(\frac{dy}{dx}\right)^3 + x.$$

A.

B.

C.

D.

Answer: 2

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2. Indicate the order of each of the following differential equations :

$y' + 3y = 0$

A.

B.

C.

D.

Answer: 1

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3. Indicate the order of each of the following differential equations :

$y' + y^2 = y.$

A.

B.

C.

D.

Answer: 1

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4. Determine the order and degree of each of the following differential equation. State also whether they are linear or non-linear: $\frac{d^2y}{dx^2} + 4y = 0$

A.

B.

C.

D.

Answer: 2

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5. Indicate the order of each of the following differential equations :

$y^{'''''} + y = 0.$

A.

B.

C.

D.

Answer: 5

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6. Indicate the order of each of the following differential equations :

$y' + 2y = \sin x$

A.

B.

C.

D.

Answer: 1

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7. Indicate the order of each of the following differential equations :

$y^{iv} + y = \sin x.$

A.

B.

C.

D.

Answer: 4

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8. In each of the following differential equations, indicate its degree, wherever possible. Also, give the order of each of them

$y'' + y^2 = 0$

A.

B.

C.

D.

Answer: Degree 1 , order 2

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9. In each of the following differential equations, indicate its degree, wherever possible. Also, give the order of each of them

$y^{iv} + y''' + y'' + y' + y = 0.$

A.

B.

C.

D.

Answer: Degree 1 , order 4

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10. In each of the following differential equations, indicate its degree, wherever possible. Also, give the order of each of them

$y(y')^2 + y^2 - 1 = 0.$

A.

B.

C.

D.

Answer: Degree 2, order 1.

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11. In each of the following differential equations indicate its degree, wherever possible. Also, give the order of each of them. $\frac{dy}{dx} + \sin\left(\frac{dy}{dx}\right) - 0$ (ii) $\frac{d^5y}{dx^5} + e^{dy/dx} + y^2 = 0$ (iii) $\frac{d^4y}{dx^4} + \frac{\sin(d^3y)}{dx^3} = 0$ (iv) $\left(\frac{d^2y}{dx^2}\right) + \cos\left(\frac{dy}{dx}\right) = 0$

A.

B.

C.

D.

Answer: Degree not defined, order 1.

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12. In each of the following differential equations, indicate its degree, wherever possible. Also, give the order of each of them

$y^{v} + y^{2} + e^{v'} = 0$

A.

B.

C.

D.

Answer: Degree not defined, order 5

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13. Determine the order and degree of each of the following differential equation. State also whether they are linear or non-linear: $\frac{dy}{dx} + e^{y} = 0$

A.

B.

C.

D.

Answer: Degree 1, order 1

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14. In each of the following differential equations, indicate its degree, wherever possible. Also, give the order of each of them

$(y'')^2 + (y')^3 + \sin y = 0$

A.

B.

C.

D.

Answer: Degree 2, order 2

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15. In each of the following differential equations, indicate its degree, wherever possible. Also, give the order of each of them

$y^{iv} + \sin y''' = 0$

A.

B.

C.

D.

Answer: Degree not defined, order 4

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16. In each of the following differential equations, indicate its degree, wherever possible. Also, give the order of each of them

$y''' + y'' + y' + y \sin y = 0.$

A.

B.

C.

D.

Answer: Degree 1, order 3.

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17. Find the order and degree, if defined, of the following differential equation :

$$\frac{d^2y}{dx^2} + y = 0$$

A.

B.

C.

D.

Answer: Order 2, degree 1

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18. Write order and degree (if defined) of each of the following differential equations.

$$\frac{d^3y}{dx^3}+2\frac{d^2y}{dx^2}+\frac{dy}{dx}=0$$

A.

B.

C.

D.

Answer: Order 3, degree 1

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19. Find the order and degree, if defined, of the following differential equation :

$$xy\frac{d^2y}{dx^2}+x\left(\frac{dy}{dx}\right)^2-y\frac{dy}{dx}=0$$

A.

B.

C.

D.

Answer: Order 2, degree 1

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20. Find the order and degree, if defined, of the following differential equation :

$y''' + y^2 + e^x = 0$

A.

B.

C.

D.

Answer: Order 3, degree 1

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21. Find the order and degree, if defined, of the following differential equation :

$$x^2\frac{d^2y}{dx^2}=\left[1+\left(\frac{dy}{dx}\right)^2\right]^4$$

A.

B.

C.

D.

Answer: Order 2, degree 1

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22. Find the order and degree, if defined, of the following differential equation :

$$\frac{d^2y}{dx^2} = \frac{2y^3 + \left(\frac{dy}{dx}\right)^4}{\sqrt{\frac{d^2y}{dx^2}}}$$

A.

B.

C.

D.

Answer: Order 2, degree 3

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23. what is the order of the differential equation $\left(\frac{dy}{dx}\right)^2 + \frac{dy}{dx} - \sin^2 y = 0$?

A.

B.

C.

D.

Answer: Order 1, degree 2

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24. Find the order and degree, if defined, of each of the following differential equations: (i) $\frac{dy}{dx} - \cos x = 0$ (ii) $xy\frac{d^2y}{dx^2} + x\left(\frac{dy}{dx}\right)^2 - y\frac{dy}{dx} = 0$ (iii) $y^m + y^2 + e^{y'} = 0$

A.

B.

C.

D.

Answer: Order 2, degree 1

Watch Video Solution

25. Find the order and degree, if defined, of the following differential equation :

$$\frac{d^3y}{dx^3} + x^2\left(\frac{d^2y}{dx^2}\right)^3 = 0$$

A.

B.

C.

D.

Answer: Order 3, degree 1

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26. Write order and degree (if defined) of each of the following differential equations.

$$x^3\left(\frac{d^2y}{dx^2}\right)^2+x\left(\frac{dy}{dx}\right)^4=0$$

A.

B.

C.

D.

Answer: Order 2, degree 2.

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27. Find the order and degree, if defined, of the following differential equation :

$y''' + 5y'' + y' = 0.$

A.

B.

C.

D.

Answer: Order 3, degree 1.

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28. Determine the order and degree of each of the following differential equation. State also whether they are linear or non-linear: $(xy^2 + x)dx + (y - x^2)dy = 0$

A.

B.

C.

D.

Answer: Order 1, degree 1 ; non-linear.

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29. Find the order the degree, if defined, of the following differential equation and state whether they are linear or non-linear :

$\sqrt{1-x^2}dx+\sqrt{1-y^2}dy=0.$

A.

B.

C.

D.

Answer: Order 1, degree 1 ; non-linear.

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30. Find the order the degree, if defined, of the following differential equation and state whether they are linear or non-linear :

$\left(\frac{d^2y}{dx^2}\right)^2+7\left(\frac{dy}{dx}\right)^3+y=0.$

A.

B.

C.

D.

Answer: Order 2, degree 2 ; non-linear.

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31. Find the order the degree, if defined, of the following differential equation and state whether they are linear or non-linear :

$$xy\frac{dy}{dx} = \left(\frac{1+y^2}{1+x^2}\right)(1+x+x^2).$$

A.

B.

C.

D.

Answer: Order 1, degree 1 ; non-linear.

Watch Video Solution

32. Write the order and degree of the following differential equations :

$$\left(\frac{ds}{dx}\right)^4 + 3s\frac{d^2s}{dt^2} = 0$$

A.

B.

C.

D.

Answer: Order 2, degree 1

Watch Video Solution

33. Write the order and degree of the following differential equations :

$$\left(\frac{d^2y}{dx^2}\right)^2 + \left(\frac{dy}{dx}\right)^3 + 2y = 0$$

A.

B.

C.

D.

Answer: Order 2, degree 2

Watch Video Solution

34. Write the order and degree of the following differential equations :

$$\left(\frac{dy}{dx}\right)^3 + \frac{d^2y}{dx^2} + 6 = 0$$

A.

B.

C.

D.

Answer: Order 2, degree 1

Watch Video Solution

35. Write the order and degree of the following differential equations :

$$\left(\frac{d^2y}{dx^2}\right)^3 + \left(\frac{dy}{dx}\right)^4 + 7 = 0.$$

A.

B.

C.

D.

Answer: Order 2, degree 3

Watch Video Solution

36. Find the order of the differential equation :

$$y = \frac{dy}{dx} + \sqrt{1 + \left(\frac{dy}{dx}\right)^3}.$$

A.

B.

C.

D.

Answer: 1

Watch Video Solution

EXERCISE 9 (b) Short Answer Type Questions

1. verify that the given function is a solution of the differential equations :

$$\frac{dy}{dx} + \sin x = 0, y = \cos x + c.$$

A.

B.

C.

D.

Watch Video Solution

2. Verify that the function$y = a \cos x + b s \in x$, where, a, $b \in R$ is a solution of the differential equation $\frac{d^2y}{dx^2} + y = 0$.

A.

B.

C.

D.

Watch Video Solution

3. verify that the given function is a solution of the differential equations

:

$y'' + y = 0, y = A \cos x - B \sin x.$

A.

B.

C.

D.

Watch Video Solution

4. verify that the given function is a solution of the differential equations

:

$y'' + 4y = 0, A\cos 2x + B\sin 2x$

A.

B.

C.

D.

Watch Video Solution

5. verify that the given function is a solution of the differential equations

:

$y'' + 4y = 0,\ y = A\cos 2x - B\sin 2x.$

A.

B.

C.

D.

Watch Video Solution

6. verify that the given function is a solution of the differential equations

:

$x^2\frac{d^2y}{dx^2} + x\frac{dy}{dx} - y = 0,\ y = Ax + \frac{B}{x}.$

A.

B.

C.

D.

Watch Video Solution

7. verify that the given function is a solution of the differential equations :

$$\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + 2y = 0, y = e^x(\sin x + \cos x).$$

A.

B.

C.

D.

Watch Video Solution

8. Verify that $y = -x - 1$ is a solution of the differential equation $(y - x)dy - (y^2 - x^2)dx = 0$.

A.

B.

C.

D.

Watch Video Solution

9. Verify that the function$y = a \cos x + b s \in x$, where, a, $b \in R$ is a solution of the differential equation $\frac{d^2y}{dx^2} + y = 0$.

A.

B.

C.

D.

Watch Video Solution

10. Verify that $ax^2 + by^2 = 1$ is a solution of the differential equation $x\left(xy_2 + y_1^2\right) = yy_1$.

A.

B.

C.

D.

Watch Video Solution

EXERCISE 9 (b) Long Answer Type Questions (I)

1. Verify that each of the following functions $y: R \rightarrow R$, as defined below, is the solution of the accompanying initial value problems :

$y = e^x : y' = y, y(0) = 1$

A.

B.

C.

D.

Watch Video Solution

2. Verify that each of the following functions $y: R \rightarrow R$, as defined below, is the solution of the accompanying initial value problems :

$y = x^2 + 2x + 1, y''' = 0, y(0) = 1, y'(0) = 2, y''(0) = 2$

A.

B.

C.

D.

Watch Video Solution

3. Verify that each of the following functions $y: R \rightarrow R$, as defined below, is the solution of the accompanying initial value problems :

$y = \cos x (x \in R) : y' ' + y = 0, y(0) = 1, y'(0) = 0.$

A.

B.

C.

D.

Watch Video Solution

4. Show that the differential equation of which $y = 2(x^2 - 1) + ce^{-x}$ ^ 2 is a solution, is $\frac{dy}{dx} + 2xy = 4x^3$.

A.

B.

C.

D.

Watch Video Solution

5. Show that $y = ax^3 + bx^2 + c$ is a solution of the differential equation $\frac{d^3y}{dx^3} = 6a$.

A.

B.

C.

D.

Watch Video Solution

EXERCISE 9 (c) Short Answer Type Questions

1. Represent the following families of curves by forming the corresponding differential (a, b : parameters) :

$y = ax$

A.

B.

C.

D.

Answer: $xy' - y = 0$

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2. Represent the following families of curves by forming the corresponding differential (a, b : parameters) :

$y = a \sin x.$

A.

B.

C.

D.

Answer: $\frac{dy}{dx} = y \cot x.$

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3. Represent the following families of curves by forming the corresponding differential equations (a, b being parameters):

$x^2 + (y - b)^2 = 1$ ii. $y = ax^3$

A.

B.

C.

D.

Answer: $x^2(y^2+1) = y'^2$.

Watch Video Solution

4. Represent the following families of curves by forming the corresponding differential equations (a, b being parameters): $x^2+y^2=a^2$ ii. $x^2-y^2=a^2$

A.

B.

C.

D.

Answer: $x - yy' = 0$

Watch Video Solution

5. Represent the following families of curves by forming the corresponding differential equations (a, b being parameters): $(x-a)^2 - y^2 = 1$ ii. $x^2 + y^2 = ax^3$

A.

B.

C.

D.

Answer: $y^2 y'^2 - y^2 = 1.$

Watch Video Solution

6. Represent the following families of curves by forming the corresponding differential equations (a, b being parameters): $y^2 = 4ax$ ii. $y^2 = 4a(x-b)$

A.

B.

C.

D.

Answer: $y - 2xy' = 0$

Watch Video Solution

7. Represent the following families of curves by forming the corresponding differential equations (a, b being parameters): $y^2 = 4ax$ ii. $y^2 = 4a(x - b)$

A.

B.

C.

D.

Answer: $yy'' + y'^2 = 0$

Watch Video Solution

8. Form the differential equation representing the family of curves $(y-b)^2 = 4(x-a)$.

A.

B.

C.

D.

Answer: $2y'' + y'^3 = 0$

Watch Video Solution

9. Represent the following families of curves by forming the corresponding differential equations (a, b being parameters): $x^2 + (y-b)^2 = 1$ ii. $y = ax^3$

A.

B.

C.

D.

Answer: $xy' = 3y$

Watch Video Solution

10. Represent the following families of curves by forming the corresponding differential equations (a, b being parameters): $(x-a)^2 - y^2 = 1$ ii. $x^2 + y^2 = ax^3$

A.

B.

C.

D.

Answer: $x^2 + 3y^2 = 2xyy'$

Watch Video Solution

11. Represent the following families of curves by forming the corresponding differential (a, b : parameters) :

$y = e^{ax}$.

A.

B.

C.

D.

Answer: $xy' = y \log y$

Watch Video Solution

12. Show that the differential equation of which $y = 2(x^2 - 1) + ce^{-x}$ ^ 2 is a solution, is $\frac{dy}{dx} + 2xy = 4x^3$.

A.

B.

C.

D.

Watch Video Solution

13. Form the differential equation of the family of lines making equal intercepts on the co-ordinate axes.

A.

B.

C.

D.

Answer: $\frac{dy}{dx} + 1 = 0$

Watch Video Solution

14. Form the differential equation corresponding to $y^2 - 2ay + x^2 = a^2$ by eliminating $a\cdot$

A.

B.

C.

D.

Answer: $x^2\left(\frac{dy}{dx}\right)^2 - 4xy\frac{dy}{dx} - 2y^2\left(\frac{dy}{dx}\right)^2 - x^2 = 0$

Watch Video Solution

15. Form a differential equation representing the given family of curves by eliminating arbitrary constants a and b.$y = e^{2x}(a + bx)$

A.

B.

C.

D.

Answer: $\frac{d^2y}{dx^2} - 4\frac{dy}{dx} + 4y = 0$

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16. From the differential equation of the family of curves $y^2 = m(a^2 - x^2)$, where a and m are parameters.

A.

B.

C.

D.

Answer: $xyy'' + xy'^2 = yy'$

Watch Video Solution

17. Show that $y = A\cos mx + B\sin mx$ is a solution of differential equation $\frac{d^2y}{dx^2 + m^2y = 0}$

A.

B.

C.

D.

Answer: $y'' + m^2y = 0$

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18. Eliminate 'a' and 'b' from :

$y = a\cos x + b\sin x.$

A.

B.

C.

D.

Answer: $y'' + y = 0$

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EXERCISE 9 (c) Long Answer Type Questions (I)

1. Differential equation of the family of curves $v = \frac{A}{r} + B,$ where A and B are arbitrary constants, is (a) $(b)(c)(d)\frac{(e)(f)d^{(g)2(h)}(i)v}{j}\left((k)d(l)r^{(m)2(n)}(o)\right)(p)(q) + (r)\frac{1}{s}r(t)(u)(v$

(cc) (b)

$(dd)(ee)(ff)\frac{(gg)(hh)d^{(ii)2(jj)}(kk)v}{ll}\left((mm)d(\cap)r^{(oo)2(pp)}(qq)\right)(rr)(ss$

(eee) (c) *[Math Processing Error]* (ee) (d) None of these

A.

B.

C.

D.

Answer: $r\frac{d^2v}{dr^2}+2\frac{dv}{dr}=0$

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2. Form the differential equation representing the family of curves $y=A\cos(x+B)$ where AS and B are parameters.

A.

B.

C.

D.

Answer: $\dfrac{d^2y}{dx^2} + y = 0$

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3. Form the differential equation representing the family of curves $y = as \in (x + b)$, where a, b are arbitrary constants.

A.

B.

C.

D.

Answer: $\dfrac{d^2y}{dx^2} + y = 0$

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4. Find the differential equation of the family of curves given by

$x^2 + y^2 = 2ax$

A.

B.

C.

D.

Answer: $2xy\frac{dy}{dx} + x^2 - y^2 = 0$

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5. Form the differential equation of the family of curves :

$y = Ae^x + Be^{-x}$

A.

B.

C.

D.

Answer: $\frac{d^2y}{dx^2} = y$

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6. Obtain the differential equation of the family of curves represented by $y = Ae^x + Be^{-x} + x^2$, where A and B are arbitrary constants.

A.

B.

C.

D.

Answer: $\frac{d^2y}{dx^2} - y = -x^2 + 2$

Watch Video Solution

7. Which of the following is a differential equation of the family of curves

$y = Ae^{2x} + Be^{-2x}$

A.

B.

C.

D.

Answer: $\frac{d^2y}{dx^2} - \frac{dy}{dx} - 6y = 0$

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8. Form the differential equation of the family of curves :

$y = Ae^{2x} + Be^{-3x}$

A.

B.

C.

D.

Answer: $\dfrac{d^2y}{dx^2} + \dfrac{dy}{dx} - 6y = 0$

Watch Video Solution

9. Find the differential equation of the family of curves $y = Ae^{2x} + Be^{-2x}$, where A and B are arbitrary constants.

A.

B.

C.

D.

Answer: $\dfrac{d^2y}{dx^2} = 4y$

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10. The differential equation for $y = e^x(a\cos x + b\sin x)$ is

A.

B.

C.

D.

Answer: $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + 2y = 0$

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11. Obtain the differential equation by eliminating 'a' and 'b' from the equation :

$y = e^x(a\cos 2x + b\sin 2x)$.

A.

B.

C.

D.

Answer: $\dfrac{d^2y}{dx^2} - 2\dfrac{dy}{dx} + 5y = 0$

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12. Show that the differential equation of the family of circles having their centres at the origin and radius 'a' is :

$x + y\dfrac{dy}{dx} = 0.$

A.

B.

C.

D.

Answer:

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13. Find the differential equation of all the circles which pass thorough the origin and whose centres lie on x-axis.

A.

B.

C.

D.

Answer: $y^2 = x^2 + 2xy\frac{dy}{dx}$

Watch Video Solution

14. Find the differential equation of all the circles which pass through the origin and whose centres lie on y-axis.

A.

B.

C.

D.

Answer: $\left(x^2 - y^2\right)\dfrac{dy}{dx} = 2xy$.

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15. Obtain the differential equation of the family of circles :

with centre at (1, 2)

A.

B.

C.

D.

Answer: $yy' - 2y' + x - 1 = 0$

Watch Video Solution

16. Form the differential equation of the family of circles in the second quadrant and touching the coordinate axes.

A.

B.

C.

D.

Answer: $(x+y)^2\left[(y')^2+1\right]=(x+yy')^2$

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17. Obtain the differential equation of the family of circles :

having radius 3 and centre on y-axis.

A.

B.

C.

D.

Answer: $\left(1+(y')^2\right)^3=9y''$

Watch Video Solution

18. Form the differential equation of the family of circles in the first quadrant which touch the coordinate axes.

A.

B.

C.

D.

Answer: $(x-y)^2(1+y)^2\Big)=(x+yy')^2$

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19. Find the order of the differential equation of the family of all circles with their centres at the origin.

A.

B.

C.

D.

Answer: $x + yy' = 0$

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20. Find the differential equation of all parabolas whose axes are parallel to y-axis.

A.

B.

C.

D.

Answer: $\frac{d^3y}{dx^3} = 0$

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21. Form the differential equation of the family of parabolas having vertex at origin and axis along positive y-axis.

A.

B.

C.

D.

Answer: $xy' - 2y = 0$

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22. The differential equation of all parabolas each of which has a latus rectum $4a$ and whose axes are parallel to the x-axis is (a) of order 1 and degree 2 (b) of order 2 and degree 3 (c) of order 2 and degree 1 (d) of order 2 and degree 2

A.

B.

C.

D.

Answer:

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23. Show that the differential equation that represents the family of all parabolas having their axis of symmetry coincident with the axis of $\xi syy_2 + y12 = 0.$

A.

B.

C.

D.

Watch Video Solution

24. Form the differential equation of the family of ellipses having foci on y-axis and centre at origin.

A.

B.

C.

D.

Answer: $xyy'' + xy'^2 - yy' = 0$

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25. Form the differential equation of the family of hyperbola having foci on x-axis and center at the origin.

A.

B.

C.

D.

Answer: $xyy'' + xy'^2 - yy' = 0$

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26. A population grows at the rate of 5% per year. If $x = x(t)$ denotes the number of individuals in the population after t years, then the rate of change of x is equal to 5% of x. Form the desired differential equation .

A.

B.

C.

D.

Answer: $\frac{dx}{dt} = \frac{5}{100}x$.

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EXERCISE 9 (d) Short Answer Type Questions

1. Find the general solution of the following :

$(x+2)\frac{dy}{dx} = x^2 + 4x - 9$.

A.

B.

C.

D.

Answer: $y = \frac{1}{2}x^2 + 2x - 13\log|x+2| + c.$

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2. Write the general solution of the following differential equations

$$\frac{dy}{dx} = x^5 + x^2 - \frac{2}{x}$$

A.

B.

C.

D.

Answer: $\frac{1}{6}x^6 + \frac{1}{3}x^3 - 2\log|x| + c.$

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3. Find the general solution of the following :

$$\sqrt{1-x^6}dy = x^2 dx.$$

A.

B.

C.

D.

Answer: $y = \frac{1}{3}\sin^{-1}x^3 + c.$

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4. Find the general solution of the following :

$$(4+5\sin x)\frac{dy}{dx} = \cos x.$$

A.

B.

C.

D.

Answer: $y = \frac{1}{5}\log|4 + 5\sin x| + c.$

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5. Find the general solution of the following :

$\frac{dy}{dx} = \cos^3 x \sin^4 x + x\sqrt{2x + 1}.$

A.

B.

C.

D.

Answer: $y = \frac{1}{5}\sin^5 x - \frac{1}{7}\sin^7 x - \frac{1}{6}(2x + 1)^{3/2} + \frac{1}{10}(2x + 1)^{5/2} + c$

.

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6. Find the general solution of the following :

$$\frac{dy}{dx} = \frac{1}{\sin^4 x + \cos^4 x}$$

A.

B.

C.

D.

Answer: $y = -\frac{1}{\sqrt{2}}\tan^{-1}\left(\frac{\sqrt{2}}{\tan 2x}\right) + c.$

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7. Find the general solution of the differential equation

$$\frac{dy}{dx} = \sin^{-1} x.$$

A.

B.

C.

D.

Answer: $y = x\sin^{-1}x + \sqrt{1-x^2} + c$.

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8. Find the general solution of the following :

$$(1+\cos x)\frac{dy}{dx} = (1-\cos x)$$

A.

B.

C.

D.

Answer: $y = 2\tan.\frac{x}{2} - x + c$.

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9. Find the general solution of the following :

$(1 + \cos x)dy = (1 - \cos x)dx.$

A.

B.

C.

D.

Answer: $y = 2\tan.\ \frac{x}{2} - x + c.$

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10. Find the general solution of the following :

$\frac{dy}{dx} = \log x.$

A.

B.

C.

D.

Answer: $y = x(\log x - 1) + c$.

Watch Video Solution

11. Solve the following differential equation: $\frac{dy}{dx} - x\sin^2 x = \frac{1}{x\log x}$

A.

B.

C.

D.

Answer: $y = \frac{1}{4}x^2 - \frac{x}{4}\sin 2x - \frac{1}{8}\cos 2x + \log|\log x| + c$.

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12. Find the general solution of the following :

$$\frac{dy}{dx} + 3x = e^{-2x}.$$

A.

B.

C.

D.

Answer: $y = \frac{-3x^2}{2} - \frac{e^{-2x}}{2} + c.$

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13. $\frac{dy}{dx} = \sin^3 x \cos^2 x + xe^x$

A.

B.

C.

D.

Answer: $y = \frac{1}{5}\cos^5 x - \frac{1}{3}\cos^3 x + (x-1)e^x + c.$

Watch Video Solution

14. Solve : $\frac{dy}{dx} = \frac{1}{1+x^2}, y(0) = 3.$

A.

B.

C.

D.

Answer: $y = \tan^{-1} x + 3.$

Watch Video Solution

15. $\left(x^3 + x^2 + x + 1\right)\frac{dy}{dx} = 2x^2 + x; y = 1 when x = 0$

A.

B.

C.

D.

Answer: $y = \frac{1}{2}\log|x+1| + \frac{3}{4}\left(x^2+1\right) - \frac{1}{2}\tan^{-1}x + 1.$

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16. $\cos\left(\frac{dy}{dx}\right) = a\ (a \in \mathbb{R});\ y = 1 when\ x = 0$

A.

B.

C.

D.

Answer: $\cos\left(\frac{y-1}{x}\right) = a$

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17. $\sin\left(\frac{dy}{dx}\right) = a$, when $x = 0, y = 1$

A.

B.

C.

D.

Answer: $\sin\left(\frac{y-1}{x}\right) = a$

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18. Find the particular solution of $\cos\left(\frac{dy}{dx}\right) = a$, given that $y = 2$ when $x = 0$

A.

B.

C.

D.

Answer: $\cos\left(\frac{y-2}{x}\right)=\frac{1}{3}$

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19. Find the particular solution of $e^{\frac{dy}{dx}}=x+1$, given that when $x=0, y=3$.

A.

B.

C.

D.

Answer: $y=x\log(x+1)+\log|x+1|-x+3$

Watch Video Solution

20. Find the equation of the curve passing through the point (1, 1) whose differential equation is $xdy = (2x^2 + 1)dx (x \neq 0)$.

A.

B.

C.

D.

Answer: $y = x^2 + \log|x|$.

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EXERCISE 9 (e) Short Answer Type Questions

1. Solve the equation: $\frac{dy}{dx} + y = 1, y \neq 1$

A.

B.

C.

D.

Answer: $y = 1 + ae^{-x}$.

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2. $\dfrac{dy}{dx} = \sin^2 y$

A.

B.

C.

D.

Answer: $x + \cot y = c$.

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3. Solve the following differential equation: $\frac{dy}{dx} = \frac{1 - \cos 2y}{1 + \cos 2y}$

A.

B.

C.

D.

Answer: $x + \cot y + y = c$

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4. Solve: $\frac{dy}{dx} = \frac{1}{y^2 + \sin y}$

A.

B.

C.

D.

Answer: $x = \frac{y^3}{3} - \cos y + c$.

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5. Solve $\frac{dy}{dx} = \sqrt{4 - y^2}$

A.

B.

C.

D.

Answer: $y = 2 \sin(x + c)$.

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EXERCISE 9 (f) Short Answer Type Questions

1. Find the general solution of each of the following differential equations:

$\frac{dy}{dx} + y = 1(y \neq 1)$

A.

B.

C.

D.

Answer: $y = 1 + ce^{-x}$

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2. $\frac{dy}{dx} = e^{x+y}$

A.

B.

C.

D.

Answer: $e^{x} + e^{-y} = c$

Watch Video Solution

3. Find the general solution of each of the following differential equations:

$\left(e^{x} + e^{-x}\right)dy - \left(e^{x} - e^{-x}\right)dx = 0$

A.

B.

C.

D.

Answer: $y = \log\left|e^{x} + e^{-x}\right| + c$

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4. Solve the following differential equation: $y(1+e^x)dy = (y+1)e^x dx$

A.

B.

C.

D.

Answer: $y = \log|c(e^x+1)(y+1)|$

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5. Solve the following differential equation:
$x(e^{2y}-1)dy + (x^2-1)e^y dx = 0$

A.

B.

C.

D.

Answer: $e^y + \frac{1}{e^y} + \frac{1}{2}x^2 - \log|x| = c$

Watch Video Solution

6. Find the general solution of each of the following differential equations:

$\frac{dy}{dx} = e^{x-y} + x^2 e^{-y}$

A.

B.

C.

D.

Answer: $e^y = e^x + \frac{x^3}{3} + c$

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7. Find the general solution of each of the following differential equations:

$$\frac{dy}{dx} = e^{x+y} + x^2 e^y$$

A.

B.

C.

D.

Answer: $e^{-y} + e^x + \frac{1}{3}x^3 + c = 0$

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8. Find the general solution of the following differential equations :

$$\left(x^2 + 1\right)\frac{dy}{dx} = xy.$$

A.

B.

C.

D.

Answer: $y = c(x^2 + 1)$

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9. Find the general solution of each of the following differential equations:

$$y(1 - x^2)\frac{dy}{dx} = x(1 + y^2)$$

A.

B.

C.

D.

Answer: $(1 + y^2)(1 - x^2) = c$

Watch Video Solution

10. Find the general solution of each of the following differential equations:

$$\frac{dy}{dx} = \left(1 + x^2\right)\left(1 + y^2\right)$$

A.

B.

C.

D.

Answer: $\tan^{-1} y = x + \frac{1}{3}x^3 + c$

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11. Find the general solution of the following differential equations :

$$\frac{dy}{dx} = \left(4 + x^2\right)\left(9 + y^2\right)$$

A.

B.

C.

D.

Answer: $\frac{1}{3}\tan^{-1}.\frac{y}{3}=4x+\frac{1}{3}x^3+c$

Watch Video Solution

12. Find the general solution of each of the following differential equations:

$$\frac{dy}{dx}=(1+x)\left(1+y^2\right)$$

A.

B.

C.

D.

Answer: $\tan^{-1}y=x+\frac{1}{2}x^2+c$

Watch Video Solution

13. Find the general solution of each of the following differential equations:

$(y + xy)dx + (x - xy^2)dy = 0$

A.

B.

C.

D.

Answer: $\log|xy| + x - \frac{y^2}{2} = c$

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14. Find the general solution of the following differential equations :

$\sqrt{1 + x^2}dy + \sqrt{1 + y^2}dx = 0.$

A.

B.

C.

D.

Answer: $\left(x+\sqrt{1+x^2}\right)\left(y+\sqrt{1+y^2}\right)=c.$

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EXERCISE 9 (f) Long Answer Type Questions (I)

1. Solve the following differential equations

$x^2(y+1)dx+y^2(x-1)dy=0$

A.

B.

C.

D.

Answer: $\frac{1}{2}(x^2+y^2)+x-y+\log|(x-1)(y+1)|=c$

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2. Find the general solution of each of the following differential equations:

$x(x^2-x^2y^2)dy+y(y^2+x^2y^2)dx=0$

A.

B.

C.

D.

Answer: $\log\left|\frac{x}{y}\right|=\frac{1}{2}\left(\frac{1}{x^2}+\frac{1}{y^2}\right)+c$

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3. Solve the following differential equations

$$\frac{dy}{dx} = -\sqrt{\frac{1-y^2}{1-x^2}}$$

A.

B.

C.

D.

Answer: $\sin^{-1} y + \sin^{-1} x = c$

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4. Solve the following differential equations :

$$\frac{dy}{dx} = \frac{x+1}{2-y}(y \neq 2)$$

A.

B.

C.

D.

Answer: $x^2 + y^2 + 2x - 4y + c = 0$

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5. Solve the following differential equations :

$$\frac{dy}{dx} + \frac{y(y-1)}{x(x-1)} = 0.$$

A.

B.

C.

D.

Answer: $(x-1)(y-1) = cxy$

Watch Video Solution

6. Find the general solution of each of the following differential equations:

$$\frac{dy}{dx} = 1 - x + y - xy$$

A.

B.

C.

D.

Answer: $\log|x + y| - x - \frac{1}{2}x^2 + c$

Watch Video Solution

7. Solve the following differential equations :

$$\frac{dy}{dx} = x - 1 + xy - y.$$

A.

B.

C.

D.

Answer: $\log|y+1| = \frac{x^2}{2} - x + c$

Watch Video Solution

8. Solve the following differential equations :

$$x\frac{dy}{dx} = y - x\tan\left(\frac{y}{x}\right).$$

A.

B.

C.

D.

Answer: $x \sin. \frac{y}{x} = c$

Watch Video Solution

9. Solve the following differential equations :

$x \sin y dy + (xe^x \log x + e^x)dx = 0.$

A.

B.

C.

D.

Answer: $-\cos y + e^x \log x = c$

Watch Video Solution

10. Solve the following differential equations :

$$\frac{dy}{dx} = \frac{xe^x \log x + e^x}{x \cos y}$$

A. $\sin y = e^{3x} \log x + c.$

B. $\sin y = e^x \log x + c.$

C. $\cos y = e^x \log x + c.$

D. $\cos y = e^{3x} \log x + c.$

Answer: B

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11. Solve the following differential equation:
$\cos x \cos y \frac{dy}{dx} = -\sin x \sin y$

A.

B.

C.

D.

Answer: $\sin y = c \cos x$

Watch Video Solution

12. Solve the following differential equation:

$\tan y\,dx + \sec^2 y \tan x\,dy = 0$

A.

B.

C.

D.

Answer: $\sin x \tan y = c$

Watch Video Solution

13. $\sec^2 \tan y dx + \sec^2 y \tan x dy = dy = 0$

A.

B.

C.

D.

Answer: $\tan x \tan y = c$

Watch Video Solution

14. Solve the following differential equations :

$(1+\cos x)dy = (1-\cos y)dx.$

A.

B.

C.

D.

Answer: $-\cot.\frac{y}{2} = \tan.\frac{x}{2} + c$

Watch Video Solution

15. Solve the following differential equation:

$\cos x(1+\cos y)dx - \sin y(1+\sin x)dy = 0$

A.

B.

C.

D.

Answer: $(1+\sin x)(1+\cos y)=c$

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16. Solve the following differential equation: $\cos ec\, x \log y \frac{dy}{dx} + x^2y^2 = 0$

A.

B.

C.

D.

Answer: $-\frac{\log y}{y} - \frac{1}{y} - x^2\cos x + 2x\sin x + 2\cos x = c$

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17. $y \log y dx - x dy = 0$

A.

B.

C.

D.

Answer: $y = e^{cx}$.

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18. Solve the equation: $e^x \sqrt{1-y^2} dx + \frac{y}{x} dy = 0$

A.

B.

C.

D.

Answer: $\sqrt{1-y^2}=(c-1)e^x+1$

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19. Solve the following initial value equations :

$x(1+y^2)dx - y(1+x^2)dy=0$, given that $y=1$ when $x=0$.

A.

B.

C.

D.

Answer: $2x^2-y^2+1=0$

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20. Solve the following differential equation: $\sqrt{1+x^2+y^2+x^2y^2}+xy\frac{dy}{dx}=0$

A.

B.

C.

D.

Answer: $x^2+\log(x^2+x^2y^2)=1.$

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21. Find the particular solution of the differential equation $(1+y^2)(1+\log x)dx+xdy=0$, it is given that at $x=1, y=1.$

A.

B.

C.

D.

Answer: $\log|x|+\frac{1}{2}(\log x)^2=-\tan^{-1}y+\frac{\pi}{4}$

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22. Solve the following initial value equations :

$\frac{dy}{dx}=\frac{1+y^2}{1+x^2}$, given that $y=1$ when $x=0$.

A.

B.

C.

D.

Answer: $y=\frac{1+x}{1-x}$.

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23. Solve the following initial value equations :

$(1+e^{2x})dy+(1+y^2)e^x dx = 0$, given that $x=0, y=1$.

A. $e^y x = 1$

B. $e^y = 1$

C. $e^x = 1$

D. $e^x y = 1$

Answer: D

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24. Solve the following initial value problems and find the corresponding solution curves :

$y' + 2y^2 = 0, y(1) = 1$

A.

B.

C.

D.

Answer: $y = \frac{1}{2x-1}. \, x \ne \frac{1}{2}$

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25. Solve the following initial value problem: $x\frac{dy}{dx} + 1 = 0; y(-1) = 0$

A.

B.

C.

D.

Answer: $y = -\log|x|$

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26. Solve the following initial value problems and find the corresponding solution curves :

$y' = 2xy, y(0) = 1.$

A.

B.

C.

D.

Answer: $y = e^{x^2} (x \in R)$

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27. Solve the following initial value problems and find the corresponding solution curves :

$xdy + ydx = xydx, y(1) = 1$

A.

B.

C.

D.

Answer: $y = \frac{1}{x}e^{x-1}(x \in R \backslash \{0\})$

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28. Solve the following initial value problems and find the corresponding solution curves :

$x(xdy - ydx) = ydx, y(1) = 1.$

A.

B.

C.

D.

Answer: $y = xe^{1-\frac{1}{x}}(x > 0)$

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29. Solve the following initial value problems and find the corresponding solution curves :

$(x+1)y' = 2e^{-y} - 1, y(0) = 0.$

A.

B.

C.

D.

Answer: $y = \log\left(1 - \frac{1}{x+1}\right)(x \neq -1)$

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30. Find the particular solution of the following differential equation: $\frac{dy}{dx} = 1 + x^2 + y^2 + x^2y^2$, given that $y = 1$ when $x = 0$.

A.

B.

C.

D.

Answer: $\tan^{-1} y = x + \frac{1}{3}x^3 + \frac{\pi}{4}$

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31. Find the particular solution of the following :

$\frac{dy}{dx} = 4xy^2, y(0) = 1.$

A.

B.

C.

D.

Answer: $y = \dfrac{1}{2x^2 + 1}$

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32. Find the particular solution of the following :

$\dfrac{dy}{dx} = y \tan x$, given that $y = 1$ when $x = 0$.

A.

B.

C.

D.

Answer: $y = \sec x$

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33. Find the particular solution of the differential equation

$e^x \sqrt{1 - y^2} dx + \dfrac{y}{x} dy = 0$, given that $y = 1$ when $x = 0$

A.

B.

C.

D.

Answer: $\sqrt{1-y^2} = (x-1)e^x + 1$

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34. Find the particular solution of the following :

$(x+1)\frac{dy}{dx} = 2e^{-y} - 1, y(0) = 0.$

A.

B.

C.

D.

Answer: $(2 - e^y)(x+1) = 1$

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35. Find the particular solution of the following :

$\sec^2 x \tan y dx - \sec^2 y \tan x dy = 0$, given that $y = \frac{\pi}{6}, x = \frac{\pi}{3}$.

A. $\tan x = 2 \tan y$

B. $\tan x = \tan y$

C. $\tan x = 3 \tan y$

D. $\tan x = 5 \tan y$

Answer: C

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36. Find the particular solution of the following :

$\frac{dy}{dx} = x^3 \cos ecy$, given that $y(0) = 0$.

A.

B.

C.

D.

Answer: $-\cos y = \frac{1}{4}x^4 - 1$

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37. Find the particular solution of the following :

$\frac{dy}{dx} = \frac{x(2\log x + 1)}{\sin y + y\cos y}$, given that $y = \frac{\pi}{2}$, when $x = 1$.

A. $y\sin y = x^2\log x + \frac{\pi}{2}$

B. $\sin y = x^2\log x + \frac{\pi}{2}$

C. $y\sin y = x^3\log x + \frac{\pi}{2}$

D. $y\sin y = x^2\log x + \frac{\pi}{6}$

Answer: A

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38. Find the particular solution of :

(i) $\log\left(\frac{dy}{dx}\right) = 2x + y$ (ii) $\log\left(\frac{dy}{dx}\right) = ax + by$, given that $y = 0$ when $x = 0$.

A.

B.

C.

D.

Answer: (i) $e^{2x} + 2e^{-y} = 3$

(ii) $be^{ax} + ae^{-by} = a + b$

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39. The normal lines to a given curve at each point pass through $(2, 0)$. The curve passes through $(2, 3)$. Formulate the differential equation and hence find out the equation of the curve.

A.

B.

C.

D.

Answer: $(x-2)^2+y^2=9$

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40. For the differential equation :

$$xy\frac{dy}{dx}=(x+2)(y+2),$$

find the solution of curve passing through the point (1, -1).

A.

B.

C.

D.

Answer: $y = x + 2\log|x(y+2)| - 2$

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41. Find the particular solution of the differential equation $xy\frac{dy}{dx} = (x+2)(y+2)$, it being given that y = -1 when x = 1.

A.

B.

C.

D.

Answer: $y = x + 2\log|x(y+2)| - 2$

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42. In a bank, principal increases continuously at the rate of 5% per year.

In how many years Rs 1000 double itself?

A.

B.

C.

D.

Answer: $20 \log_e 2$ **years**

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43. In a bank, principal increases continuously at the rate of 5% per year. An amountof Rs 1000 is deposited with this bank, how much will it worth after 10 years $\left(e^{0.5} = 1.648\right)$

A.

B.

C.

D.

Answer: Rs. 1648

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44. A population grows at the rate of 8% per year. How long does it take for the population to double? Use differential equation for it.

A.

B.

C.

D.

Answer: 50 log 2 years

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45. The surface area of a balloon, being inflated, changes at a rate proportional to time t.

(i) If initially its radius is 1 unit and after 3 seconds it is 2 units, find the radius after time t.

(ii) If initially its radius is 3 units and after 2 seconds it is 5 units, find the radius after t seconds.

A.

B.

C.

D.

Answer: (i) $\frac{1}{\sqrt{3}}\sqrt{t^2+1}$

(ii) $\sqrt{4t^2+18}$

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EXERCISE 9 (f) Long Answer Type Questions (II)

1. A wet porous substance in the open air loses its moisture at a rate proportional to the moisture content. If a sheet hung in the wind loses half its moisture during the first hour, when will it have last 95% moisture, weather conditions remaining the same?

A.

B.

C.

D.

Answer: (i) $t = \frac{\log 10}{\log 2}$ **hours (ii)** $\frac{\log 100}{\log 2}$ **hours.**

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2. A bank pays interest by continuous compounding, that is ,by treating the interest rate as the instantaneous rate of change of principal. Suppose in an account interest accrues at 8% per year, compounded continuously. Calculate the percentage increase in such an account over one year. [take $e^{0.08} \approx 1.0833$]

A.

B.

C.

D.

Answer: $8 \cdot 33\%$

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3. The slope of tangent at a point $P(x, y)$ on a curve is $-\frac{x}{y}$. If the curve passes through the point (3, -4) , find the equation of the curve.

A.

B.

C.

D.

Answer: $x^2 + y^2 = 25$

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4. $\frac{dy}{dx} + \frac{y}{x} = 0$, where 'x' denotes the percentage population living in a city and 'y' denotes the area for living healthy life of population. Find the particular solution when $x = 100, y = 1$.

A.

B.

C.

D.

Answer: $xy = 100$

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5. Find the equation of the curve passing through the point (0, -2) given that at any point (x, y) on the curve the product of the slope of its tangent and y coordinate of the point is equal to the x-coordinate of the point.

A.

B.

C.

D.

Answer: $x^2 - y^2 + 4 = 0$

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6. At any point $P(x, y)$ of a curve, the slope of the tangent is twice the slope of the line segment joining the point of contact P to the point $(-4, -3)$ Find the equation of the curve given that it passes through the point $(-2, 1)$

A.

B.

C.

D.

Answer: $x^2 + 8x - y + 13 = 0$

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EXERCISE 9 (g) Long Answer Type Questions (I)

1. Solve the each of the following differential equation: $(x+y)\dfrac{dy}{dx} = 1$

A.

B.

C.

D.

Answer: $y = \log|x + y + 1| + c.$

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2. $\frac{dy}{dx} = (4x + y + 1)^2$

A.

B.

C.

D.

Answer: $\frac{1}{2}\tan^{-1}\left(\frac{4x + y + 1}{2}\right) = x + c.$

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3. Solve the following differential equations: $(x + y + 1)\frac{dy}{dx} = 1$

A.

B.

C.

D.

Answer: $y - \log|x + y + 2| = c$.

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4. Solve the following differential equation: $\frac{dy}{dx} = (x + y)^2$

A.

B.

C.

D.

Answer: $x + y = \tan(x + c)$

Watch Video Solution

5. Solve the following differential equations.

$$(x+y)^2 \frac{dy}{dx} = a^2$$

A.

B.

C.

D.

Answer: $\frac{a}{2}\log\left|\frac{x-y-a}{x-y+a}\right| = y + c.$

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6. Solve the following differential equations :

$$\frac{dy}{dx} = 1 + e^{x-y}.$$

A.

B.

C.

D.

Answer: $-e^{(x-y)} = -x + c$.

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7. Solve the following differential equations :

$\cos(x+y)dy = dx$

A.

B.

C.

D.

Answer: $\tan.\ \frac{x+y}{2} = y + c$

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8. $\frac{dy}{dx} = \sin(x+y)$

A.

B.

C.

D.

Answer: $\tan(x+y) - \sec(x+y) = x + c$

Watch Video Solution

9. Solve the following differential equations :

$\cos^{-1}\left(\frac{dy}{dx}\right) = x + y.$

A.

B.

C.

D.

Answer: $\tan.\frac{x+y}{2}=y+c.$

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10. Solve the following differential equations.

$$\frac{dy}{dx}=\sin(x+y)+\cos(x+y)$$

A.

B.

C.

D.

Answer: $\log\left|\tan.\frac{x+y}{2}+1\right|=x+c.$

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11. Solve the following differential equations :

$$\frac{dy}{dx} = \cot^2(x+y).$$

A.

B.

C.

D.

Answer: $y = x + \frac{1}{2}\sin 2(x+y) + c.$

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12. Solve the following differential equations :

$$\cos(x+y)dy = dx, y(0) = 0.$$

A.

B.

C.

D.

Answer: $y = \tan\left(\frac{x+y}{2}\right)$.

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13. Solve the following differential equations :

$(x+y+1)^2 dy = dx, y(-1) = 0.$

A.

B.

C.

D.

Answer: $x + y + 1 = \tan y$.

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14. Solve the following differential equations :

Find the particular solution of : $\frac{dy}{dx} = \cos(x+y+2)$, given that $x = 0, y = -2.$

A.

B.

C.

D.

Answer: $\tan. \frac{x+y+2}{2} = x.$

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EXERCISE 9 (h) Long Answer Type Questions (I)

1. Show that each of the following differential equations is homogeneous and solve each of them :

$$\frac{dy}{dx} = \frac{y}{x} + \frac{x}{y}.$$

A.

B.

C.

D.

Answer: $\frac{y^2}{2x^2} = \log|x| + c$.

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2. Show that the differential equation $\frac{(x-y)dy}{dx} = x + 2y$, is homogeneous and solve it.

A.

B.

C.

D.

Answer: $-\frac{1}{2}\log\left|x^2+xy+y^2\right|+\sqrt{3}\tan^{-1}.\ \frac{x+2y}{\sqrt{3}x}=c.$

Watch Video Solution

3. Show that each of the following differential equations is homogeneous and solve each of them :

$(x-y)dy=(x+2y)dx.$

A.

B.

C.

D.

Answer: $-\frac{1}{2}\log\left|x^2+xy+y^2\right|+\sqrt{3}\tan^{-1}.\ \frac{x+2y}{\sqrt{3}x}=c.$

Watch Video Solution

4. $(x - y)dy - (x + y)dx = 0$

A.

B.

C.

D.

Answer: $\tan^{-1}.\frac{y}{x} = \frac{1}{2}\log(x^2 + y^2) + \log c$

Watch Video Solution

5. Show that the differential equation $\frac{dy}{dx} = \frac{y - x}{y + x}$ is homogenous and solve it.

A.

B.

C.

D.

Answer: $\log(x^2+y^2)+2\tan^{-1}\left(\frac{y}{x}\right)=c.$

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6. Show that each of the following differential equations is homogeneous and solve each of them :

$(x+y)dy-(y-x)dx=0$

A.

B.

C.

D.

Answer: $\log(x^2+y^2)+2\tan^{-1}\left(\frac{y}{x}\right)=c.$

Watch Video Solution

7. Show that the differential equation $\frac{dy}{dx} = \frac{y-x}{y+x}$ is homogenous and solve it.

A.

B.

C.

D.

Answer: $\log(x^2+y^2) + 2\tan^{-1}\left(\frac{y}{x}\right) = c.$

Watch Video Solution

8. $y^2 + x^2\frac{dy}{dx} = xy\frac{dy}{dx}$

A.

B.

C.

D.

Answer: $y^2 = ce^{2y/x}, (x \neq 0)$.

Watch Video Solution

9. Show that each of the following differential equations is homogeneous and solve each of them :

$$x^2\frac{dy}{dx} = y(x+y)$$

A.

B.

C.

D.

Answer: $-\frac{x}{y} = \log|x| + c$

Watch Video Solution

10. Show that each of the following differential equations is homogeneous and solve each of them :

$$\frac{dy}{dx} = \frac{y(y+x)}{x(y-x)}.$$

A.

B.

C.

D.

Answer: $y = x\log|xy| + cx$

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11. show that the given differential equation is homogeneous and solve each of them $(x^2 + xy)dy = (x^2 + y^2)dx$

A.

B.

C.

D.

Answer: $(x - y)^2 = cxe^{-y/x}$.

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12. Show that each of the following differential equations is homogeneous and solve each of them :

$(3xy + y^2)dx = (x^2 + xy)dy$

A.

B.

C.

D.

Answer: $\log|y| + \frac{y}{x} = 3\log|x| + \log|c|$

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13. Show that each of the following differential equations is homogeneous and solve each of them :

$\left(x^2 + xy\right)dy + \left(3xy + y^2\right)dx = 0$

A.

B.

C.

D.

Answer: $2x^3y + x^2y^2 = c$

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14. Show that each of the following differential equations is homogeneous and solve each of them :

$\left(y^2 - x^2\right)dy - 3xydx = 0.$

A.

B.

C.

D.

Answer: $y^2(4x^2 - y^2)^3 = c$

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15. Show that each of the following differential equations is homogeneous and solve each of them :

$2xydx + (x^2 + 2y^2)dy = 0$

A.

B.

C.

D.

Answer: $3x^2y + 2y^3 = c$

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16. Show that each of the following differential equations is homogeneous and solve each of them :

$2xydy - (x^2 + 3y^2)dx = 0.$

A.

B.

C.

D.

Answer: $x^2 + y^2 = cx^3$

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17. Show that each of the following differential equations is homogeneous and solve each of them :

$(x^2 - y^2)dx + 2xydy = 0$

A.

B.

C.

D.

Answer: $x^2 + y^2 = cx$

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18. Show that each of the following differential equations is homogeneous and solve each of them :

$(x^2 + y^2)dx + 2xydy = 0$

A.

B.

C.

D.

Answer: $x^3 + 3xy^2 = c$

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19. Show that each of the following differential equations is homogeneous and solve each of them :

$\left(x^2 + y^2\right)dx = 2xydy.$

A.

B.

C.

D.

Answer: $\log|x| + \log\left|1 - \frac{y^2}{x^2}\right| + c = 0$

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20. Solve : $\left(x^3 + y^3\right)dy - x^2y\,dx = 0$

A.

B.

C.

D.

Answer: $y = ce^{\frac{x^3}{3y^3}}$

Watch Video Solution

21. Solution of the differential equation $x^2ydx - \left(x^3 + y^3\right)dy = 0$ is

A.

B.

C.

D.

Answer: $y = ce^{\frac{x^3}{3y^3}}$

Watch Video Solution

22. Show that each of the following differential equations is homogeneous and solve each of them :

$$\frac{dy}{dx} = \frac{x^2y}{x^3 + y^3}$$

A.

B.

C.

D.

Answer: $y = ce^{\frac{x^3}{3y^3}}$

Watch Video Solution

23. $\left(x\frac{\cos y}{x}\right)\frac{dy}{dx}=\left(y\frac{\cos y}{x}\right)+x$

A.

B.

C.

D.

Answer: $\sin\left(\frac{y}{x}\right)=\log|cx|$

Watch Video Solution

24. Solve the differential equation $ye^{\frac{x}{y}}dx=\left(xe^{\frac{x}{y}}+y^2\right)dy(y\neq 0)$

A.

B.

C.

D.

Answer: $e^{\frac{x}{y}} = y + c$

Watch Video Solution

25. Find the particular solutions of the following problems :

$x^2 dy - (x^2 + xy + y^2) dx = 0, y(1) = 1$

A.

B.

C.

D.

Answer: $\tan^{-1}. \frac{y}{x} = \log|x| + \frac{\pi}{4}$

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26. Solve the following differential equation: $(x^2 - y^2) dx + 2xy\, dy = 0$

given that $y = 1$ when $x = 1$

A.

B.

C.

D.

Answer: $x^2 + y^2 = 2x$

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27. Solve each of the following initial value problem: $2x^2 \dfrac{dy}{dx} - 2xy + y^2 = 0,\ y(e) = e$

A.

B.

C.

D.

Answer: $y = \dfrac{2x}{1 + |\log x|}, \left(x \neq 0, \pm \dfrac{1}{e}\right)$

Watch Video Solution

28. Find the particular solution of the differential equation $x\frac{dy}{dx} = y + x\cos ec\left(\frac{y}{x}\right) = 0;$ given that $y = 0$ when $x = 1$.

A.

B.

C.

D.

Answer: $\log|x| = \cos.\ \frac{y}{x} - 1(x \neq 0)$

Watch Video Solution

29. Solve each of the following initial value problem: $xe^{y/x}y + x\frac{dy}{dx} = 0,\ y(e) = 0$

A.

B.

C.

D.

Answer: $y = \; - x \log \quad \log|x|, (x \neq 0)$

Watch Video Solution

30. Solve each of the following initial value problems: $\left(xe^{y/x} + y\right)dx = x\,dy,\; y(1) = 1$

A.

B.

C.

D.

Answer: $\log|x| + e^{\frac{-y}{x}} = 1(x \neq 0)$

Watch Video Solution

31. Solve the following differential equation: $(x-y)\frac{dy}{dx}=x+2y$

A.

B.

C.

D.

Answer: $\frac{-1}{2}\log\left|1+\frac{y}{x}+\frac{y^2}{x^2}\right|+\sqrt{3}\tan^{-1}.\ \frac{2y+x}{\sqrt{3}x}=\log|x|+\frac{\pi}{2\sqrt{3}}$

Watch Video Solution

32. Solve the following differential equations :

$(x+y)dy+(x-y)dx=0,$

given that $y=1$ when $x=1$

A.

B.

C.

D.

Answer: $\frac{1}{2}\log(x^2 + y^2) - \log x \tan^{-1}. \frac{y}{x} = -\log|x| + \frac{\pi}{4} + \frac{1}{2}\log 2$

Watch Video Solution

33. Solve the following differential equations :

$x^2 dy = (2xy + y^2) dx$, given that $y = 1$ when $x = 1$.

A.

B.

C.

D.

Answer: $2y = x(y + x)$.

Watch Video Solution

34. Solve :

$$x\frac{dy}{dx} - y = \sqrt{x^2 + y^2}, x \neq 0$$

A.

B.

C.

D.

Answer: $y = \sqrt{x^2 + y^2} = cx^2$

Watch Video Solution

35. Solve $x\,dy - y\,dx = \sqrt{x^2 + y^2}dx$

A.

B.

C.

D.

Answer: $y+\sqrt{x^2+y^2}=x^2$

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36. $x\dfrac{dy}{dx}-y+x\dfrac{\sin y}{x}=0$

A.

B.

C.

D.

Answer: $x\sin.\ \dfrac{y}{x}=c\left(1+\cos.\ \dfrac{y}{x}\right);\ \left(x\sin.\ \dfrac{y}{x}\neq 0\right)$

Watch Video Solution

37. $\left(x\dfrac{\cos y}{x}\right)\dfrac{dy}{dx}=\left(y\dfrac{\cos y}{x}\right)+x$

A.

B.

C.

D.

Answer: $\sin . \frac{y}{x}=\log |x|+c$

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38. Show that the following differential equations are homogeneous and solve them :

$$x \sec^2\left(\frac{y}{x}\right) dy=\left\{y \sec^2\left(\frac{y}{x}\right)+x\right\} dx .$$

A.

B.

C.

D.

Answer: $\tan.\frac{y}{x} = \log|x| + c$

Watch Video Solution

39. Show that the given differential equation is homogeneous and solve each of them.$ydx + x\log\left(\frac{y}{x}\right)dy - 2xdy = 0$

A.

B.

C.

D.

Answer: $cy = \log.\frac{y}{x} - 1$

Watch Video Solution

40. Solve the following differential equations

$(xdy - ydx)y\sin\left(\frac{y}{x}\right) = (ydx + xdy)x\cos\left(\frac{y}{x}\right).$

A.

B.

C.

D.

Answer: $\sec\left(\frac{y}{x}\right) = cxy$.

Watch Video Solution

41. Find the particular solution of eh differential equation $\frac{dy}{dx} = \frac{xy}{x^2 + y^2}$ given that $y = 1 \; when \; x = 0$.

A.

B.

C.

D.

Answer: $\log|y| = \dfrac{x^2}{2y^2}$.

Watch Video Solution

42. Find the particular solution of the differential equation $\left\{x\dfrac{\sin^2 y}{x} - y\right\}dx + xdy = 0$, it being given that $y = \dfrac{\pi}{4}$ when $x = 1$.

A.

B.

C.

D.

Answer: $\log|x| - \cot.\ \dfrac{y}{x} + 1 = 0$

Watch Video Solution

43. Find the particular solution of the differential equation $x\frac{dy}{dx}=y+x\cos ec\left(\frac{y}{x}\right)=0;$ given that $y=0$ when $x=1$.

A.

B.

C.

D.

Answer: $1-\cos.\ \frac{y}{x}+\log|x|=0$

Watch Video Solution

44. Show that the differential equation $x\frac{dy}{dx}\sin\left(\frac{y}{x}\right)+x-y\sin\left(\frac{y}{x}\right)=0$ is homogenous. Find the particular solution of this differential equation, given that $x=1$ when $y=\frac{\pi}{2}$.

A.

B.

C.

D.

Answer: $\log|x| = \cos\left(\frac{y}{x}\right)$

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45. Find the particular solution of the differential equation $\left(xe^{y/x}+y\right)dx = xdy$, given that $y(1) = 0$.

A.

B.

C.

D.

Answer: $-e^{-y/x} = \log|x| - e^{-1}$.

Watch Video Solution

46. Show that the differential equation $2ye^{\frac{x}{y}}dx + \left(y - 2xe^{\frac{x}{y}}\right)dy = 0$ is homogeneous and find its particular solution, given that, $x = 0$when $y = 1$.

A.

B.

C.

D.

Answer: $2e^{\frac{x}{y}} + \log|y| = 2$

Watch Video Solution

47. Find the particular solution of the differential equation :

$(xdy - ydx)y\sin\left(\frac{y}{x}\right) = (ydx + xdy)x\cos.\ \frac{y}{x}$, given that $y = \pi$ and $x = 3$.

A.

B.

C.

D.

Answer: $2xy\cos.\ \frac{y}{x} = 3\pi$

Watch Video Solution

48. $\frac{dy}{dx} = \frac{y}{x} + \tan\left(\frac{y}{x}\right)$

A.

B.

C.

D.

Answer: $\sin.\ \frac{y}{x} = cx$

Watch Video Solution

49. Solve:

$$x\frac{dy}{dx} - y - x \tan.\left(\frac{y}{x}\right). = 0$$

A.

B.

C.

D.

Answer: $x \sin. \frac{y}{x} = c$

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50. Show that the family of curves for which the slope of the tangent at any point (x, y) on it is $\frac{x^2 + y^2}{2xy}$, is given by $x^2 \quad y^2 = \quad cx$.

A.

B.

C.

D.

Watch Video Solution

51. Show that the family of curves for which the slope of the tangent at any point (x, y) on it is $\frac{x^2+y^2}{2xy}$, is given by $x^2 \quad y^2 = \quad cx$.

A.

B.

C.

D.

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EXERCISE 9 (i) Short Answer Type Questions

1. Solve the differential equation $\left(\tan^{-1} y - x\right) dy = \left(1 + y^2\right) dx$.

A.

B.

C.

D.

Answer: $e^{\tan^{-1}} y$

Watch Video Solution

2. Find the integrating factor of the differential equation :

$\cos x . \dfrac{dy}{dx} + y = \sin x, 0 \le x < \dfrac{\pi}{2}$

A.

B.

C.

D.

Answer: $\sec x + \tan x$

Watch Video Solution

3. Find the integrating factor of the differential equation :

$$\cos x \frac{dy}{dx} + y = 2x + x^2$$

A.

B.

C.

D.

Answer: $\sec x + \tan x$

Watch Video Solution

4. Find the integrating factor of the differential equation :

$$x\frac{dy}{dx} + y = x\cos x.$$

A.

B.

C.

D.

Answer: x

Watch Video Solution

5. Find the general solution of each of the following differential equations:

$$\frac{dy}{dx} + y = 1(y \neq 1)$$

A.

B.

C.

D.

Answer: $y = 1 + ce^{-x}$.

Watch Video Solution

6. Find the general solution of the following differential equations :

$y' + 2y = e^{2x}$

A.

B.

C.

D.

Answer: $y = \frac{1}{4}e^{2x} + ce^{-2x}$

Watch Video Solution

7. Find the general solution of the following differential equations :

$xy' - y = (x+1)e^{-x}$

A.

B.

C.

D.

Answer: $y = -e^{-x} + cx$

Watch Video Solution

8. Solve the differential equation: $\frac{dy}{dx} + \frac{y}{x} = e^x, x > 0$

A.

B.

C.

D.

Answer: $y = \frac{1}{x}(x-1)e^{x} + c$

Watch Video Solution

9. Solve: $\frac{dy}{dx} + 3y = e^{-2x}$

A.

B.

C.

D.

Answer: $y = e^{-2x} + ce^{-3x}$

Watch Video Solution

10. Solve the following differential equation : $\frac{dy}{dx} + 2y = 6e^{x}$

A.

B.

C.

D.

Answer: $y = ce^{-2x} + 2e^{x}$.

Watch Video Solution

11. Find the general solution of the following differential equations :

$$\frac{dx}{dy} + x = \tan y + \sec^2 y.$$

A.

B.

C.

D.

Answer: $x = \tan y + ce^{-y}$.

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12. Assume that the rise in the price $p = p(t)$ of a product is proportional to the difference between the demand w(t) and the supply s(t) and that the demand depends on the price as a first degree polynomial. Set up a differential equation for the price.

A.

B.

C.

D.

Answer: $\frac{dp}{dt} = k(w - s)$, **where** $w = ap + b$.

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EXERCISE 9 (i) Long Answer Type Questions (I)

1. Solve the following differential equations :

$$x\frac{dy}{dx} = y - x$$

A.

B.

C.

D.

Answer: $y = -x\log|x| + cx$

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2. Solve the following differential equations :

$$\frac{dy}{dx} + \frac{y}{x} = x^2$$

A.

B.

C.

D.

Answer: $y = \frac{1}{4}x^3 + \frac{c}{x}$.

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3. Solve the following differential equations :

$xdy + (y - x^2y)dx = 0.$

A.

B.

C.

D.

Answer: $y = \frac{1}{4}x^3 + \frac{c}{x}$.

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4. Solve the following differential equations :

$$x\frac{dy}{dx}+2y=x^2(x\neq 0)$$

A.

B.

C.

D.

Answer: $y=\frac{1}{4}x^2+cx^{-2}$

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5. $x\frac{dy}{dx}-y=2x^3$

A.

B.

C.

D.

Answer: $y = x^3 + cx$.

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6. Solve the differential equation: $\frac{dy}{dx} + \frac{y}{2x} = 3x^2$

A.

B.

C.

D.

Answer: $y = \frac{6}{7}x^3 + \frac{c}{\sqrt{x}}$.

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7. Solve the following differential equations :

$$\frac{dy}{dx} + 2y = \sin 5x.$$

A.

B.

C.

D.

Answer: $y = \frac{1}{29}(2 \sin 5x - 5 \cos 5x) + ce^{-2x}$.

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8. Solve the following differential equations :

$$\frac{dy}{dx} + y = \cos x$$

A.

B.

C.

D.

Answer: $y = ce^{-x} + \frac{1}{2}(\cos x + \sin x)$

Watch Video Solution

9. Solve the each of the following differential equation: $\frac{dy}{dx} - y = \cos x$

A.

B.

C.

D.

Answer: $y = \frac{1}{2}(\sin x - \cos x) + ce^{x}$

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10. Solve the following differential equations :

$$\frac{dy}{dx} + 2y = \cos 3x$$

A.

B.

C.

D.

Answer: $y = \frac{3}{13}\sin 3x + \frac{2}{13}\cos 3x + ce^{-2x}$.

Watch Video Solution

11. $\frac{dy}{dx} - y = \sin x$

A.

B.

C.

D.

Answer: $y = -\frac{1}{2}(\sin x + \cos x) + ce^{x}$

Watch Video Solution

12. Solve the following differential equations :

$$\frac{dy}{dx} = y - 2\sin x.$$

A.

B.

C.

D.

Answer: $y = \sin x + \cos x + ce^{x}$.

Watch Video Solution

13. Solve the following differential equations

$$\frac{dy}{dx} - 2y = \cos 3x.$$

A.

B.

C.

D.

Answer: $y = \frac{3}{13}\sin 3x - \frac{2}{13}\cos 3x + ce^{2x}$.

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14. Solve the following differential equations :

$$\frac{dy}{dx} + \sec x . y = \tan x \left(0 \leq x < \frac{\pi}{2}\right).$$

A.

B.

C.

D.

Answer: $y(\sec x + \tan x) = \sec x + \tan x - x + c$.

Watch Video Solution

15. $\dfrac{dy}{dx} + 2y \tan x = \sin x$

A.

B.

C.

D.

Answer: $y \sec^2 x = \sec x + c$

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16. Solve the following differential equations :

$$\tan x \frac{dy}{dx} + 2y = \cos x.$$

A.

B.

C.

D.

Answer: $y \sin^2 x + \cos x = c$.

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17. Solve the following differential equations :

$$\cos x \frac{dy}{dx} + y = \sin x.$$

A.

B.

C.

D.

Answer: $y(\sec x + \tan x) = \sec x + \tan x - x + c$.

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18. $\left(y + 3x^2\right)\dfrac{dx}{dy} = x$

A.

B.

C.

D.

Answer: $y = 3x^2 + cx$.

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19. The solution of differential equation

$$\left(1+x^2\right)\frac{dy}{dx}+y=e^{\tan^{-1}x}$$

A.

B.

C.

D.

Answer: $y=\frac{1}{2}e^{\tan^{-1}x}+ce^{-\tan^{-1}x}$.

Watch Video Solution

20. Solve the following differential equation: $\frac{dy}{dx}+y=\cos x-\sin x$

A.

B.

C.

D.

Answer: $y = \cos x + ce^{-x}$

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21. Solve the following differential equations :

$$\frac{dy}{dx} + y = \sin x + \cos x.$$

A.

B.

C.

D.

Answer: $y = \sin x + ce^{-x}$.

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22. अवकल समीकरण को हल कीजिए-

$$\frac{dy}{dx} + y \tan x = 2x + x^2 \tan x$$

A.

B.

C.

D.

Answer: $y = x^2 + c \cos x$

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23. Solve the differential equation: $\frac{dy}{dx} + y \cot x = 2 \cos x$

A.

B.

C.

D.

Answer: $y \sin x = -\dfrac{\cos 2x}{2} + c.$

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24. Solve the following differential equation: $x\dfrac{dy}{dx} + 2y = x \cos x$

A.

B.

C.

D.

Answer: $y = \sin x + \dfrac{2}{x}\cos x - \dfrac{2}{x^2}\sin x + c$

Watch Video Solution

25. Solve the following differential equations

$$\frac{dy}{dx} + \frac{1}{x}y = \cos x + \frac{\sin x}{x}, \qquad x > 0.$$

A.

B.

C.

D.

Answer: $y = \sin x + \frac{c}{x}$.

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26. $\frac{dy}{dx} + y\sec x = \tan x$

A.

B.

C.

D.

Answer: $y = 1 + (c - x)(\sec x + \tan x)^{-1}$.

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27. $x\frac{dy}{dx} + y = x\log x$

A.

B.

C.

D.

Answer: $xy = \frac{x^2}{4}(2\log x - 1) + c$

Watch Video Solution

28. Solve the differential equation $x\frac{dy}{dx}-y=\log|x|$, given that $y(1)=0$.

A.

B.

C.

D.

Answer: $y+\log x+1=cx$

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29. Solve the differential equation :

$x\frac{dy}{dx}+y-x+xy\cot x=0, x\neq 0.$

A.

B.

C.

D.

Answer: $xy\sin x = \sin x - x\cos x + c$.

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30. Solver the following differential equation :

(1) $x\frac{dy}{dx} + 2y = x^2.\log x$

A.

B.

C.

D.

Answer: $y = \frac{1}{4}x^2\log x - \frac{1}{16}x^2 + cx^{-2}$

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31. find the solution of the following differential equation

$x \log x \frac{dy}{dx} + y = 2 \log x$

A.

B.

C.

D.

Answer: $y \log x = (\log x)^2 + c(x > 0)$.

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32. Solve: $(x \log x) \frac{dy}{dx} + y = \frac{2}{x} \log x$

A.

B.

C.

D.

Answer: $y \log x = -\frac{2 \log x}{x} - \frac{2}{x} + c.$

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33. Solving the following differentia equation:

$\mathrm{s\,i\,n\,x}\frac{\mathrm{dy}}{\mathrm{dx}} + \mathrm{cosx\dot{y}} = \cos x \mathrm{s\dot{i}n}^{2} \mathrm{x}$

A.

B.

C.

D.

Answer: $y \sin x = \frac{1}{3} \sin^3 x + c$

Watch Video Solution

34. Find the general solution of the following differential equations

$$\left(x^2-1\right)\frac{dy}{dx}+2xy=\frac{2}{x^2-1}$$

A.

B.

C.

D.

Answer: $y\left(x^2-1\right)=\log\left(\frac{x-1}{x+1}\right)+c$

Watch Video Solution

35. Solve the following differential equations :

$$\frac{dy}{dx}-\frac{2x}{1+x^2}y=x^2+2.$$

A.

B.

C.

D.

Answer: $y=(1+x)\left(x+\tan^{-1}x+c\right)$

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36. Find the general solution of the following differential equations

$\left(1+x^2\right)\frac{dy}{dx}+y=\tan^{-1}x$

A.

B.

C.

D.

Answer: $y=\left(\tan^{-1}x-1\right)+ce^{-\tan^{-1}x}$

Watch Video Solution

37. Solve: $\left(1+x^2\right)\frac{dy}{dx}+2xy=\cos x$

A.

B.

C.

D.

Answer: $y\left(1+x^2\right)=\sin x+c$

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38. $\left(1-x^2\right)\frac{dy}{dx}-xy=1$

A.

B.

C.

D.

Answer: $y\sqrt{1-x^2} = \sin x + c$

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39. $ydx + (x - y^2)dy = 0$

A.

B.

C.

D.

Answer: $xy = \frac{1}{3}y + c$

Watch Video Solution

40. $ydx - (x + 2y^2)dy = 0$

A.

B.

C.

D.

Answer: $x = 2y^2 + cy$.

Watch Video Solution

41. Solve the differential equation: $\left(1 + x^2\right)\frac{dy}{dx} + y = \tan^{-1} x$

A.

B.

C.

D.

Answer: $y = \left(\tan^{-1} x - 1\right) + ce^{-\tan^{-1} x}$.

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42. Solve the following differential equations :

$$\frac{dy}{dx} - \frac{y}{x} = \left(\frac{x-1}{x}\right)e^x.$$

A.

B.

C.

D.

Answer: $y = e^x + cx$.

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43. Solve the following initial value problems :

$\frac{dy}{dx} = 2x + y$, given that $x = 0, y = 0$.

A.

B.

C.

D.

Answer: $y = -2x - 2 + 2e^x$.

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44. Solve the following initial value problems :

$$x\frac{dy}{dx} + y = x^3, y(2) = 1$$

A.

B.

C.

D.

Answer: $xy = \frac{1}{4}x^4 - 2$

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45. Solve the following initial value problems :

$$x\frac{dy}{dx} + 2y = x^2, y(1) = \frac{1}{4}$$

A.

B.

C.

D.

Answer: $x^2(4y - x^2) = 0$

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46. Solve the following initial value problems :

$x\frac{dy}{dx} + 2y = x^2(x \neq 0)$, given that $y = 0$ when $x = 1$.

A.

B.

C.

D.

Answer: $x^2y = \frac{1}{4}x^4 - \frac{1}{4}$

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47. Solve each of the following initial value problem: $x\frac{dy}{dx} + y = x\cos x + \sin x,\ y\left(\frac{\pi}{2}\right) = 1$

A.

B.

C.

D.

Answer: $y = \sin x$.

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48. Solve each of the following initial value problem: $\frac{dy}{dx} = 2y\tan x = \sin x; y = 0\, when\, x = \frac{\pi}{3}$

A.

B.

C.

D.

Answer: $y = \cos x - 2\cos^2 x$

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49. $\frac{dy}{dx} + y\tan x = \sec x.$

A.

B.

C.

D.

Answer: $y = \sin x$.

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50. Solve the differential equation $\frac{dy}{dx} - 3y\cot x = \sin 2x$ given $y = 2$ when $x = \frac{\pi}{2}$.

A.

B.

C.

D.

Answer: $y + 2\sin^2 x = 4\sin^3 x$.

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51. Solve the following initial value problems :

$$\cos^3 x \frac{dy}{dx} - y \sin x \cot x = \cos x, \; y\left(\frac{\pi}{4}\right) = 1.$$

A.

B.

C.

D.

Answer: $y = \; -1 + \frac{2}{e} e^{\tan x}$,

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52. Solve the following initial value problems :

$$y e^y dx = \left(y^3 + 2xe^y\right) dy, \; y(0) = 1.$$

A.

B.

C.

D.

Answer: $x = -\frac{y^2}{e^y} + \frac{y^2}{e}$.

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53. Find the particular solution of differential equation $\frac{dy}{dx} = \frac{x + y\cos x}{1 + \sin x}$ given that $y = 1$, when $x = 0$.

A.

B.

C.

D.

Answer: $y(1 + \sin x) = -\frac{x^2}{2} + 1$.

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EXERCISE 9 (i) Long Answer Type Questions (II)

1. Solve $\frac{dy}{dx} + y \cot x = 2x + x^2 \cot x$,given that y=0 when x=0

A.

B.

C.

D.

Answer: $y = x^2$

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2. Solve $\frac{dy}{dx} + y \cot x = 2x + x^2 \cot x$,given that y=0 when x=0

A.

B.

C.

D.

Answer: $y \sin x = x^2 \sin x - \frac{\pi^2}{4}$

Watch Video Solution

3. Solve the differential equation $\frac{dy}{dx} - 3y \cot x = \sin 2x$ given $y = 2$ when $x = \frac{\pi}{2}$.

A.

B.

C.

D.

Answer: $y = 4 \sin^3 x - 2 \sin^2 x$.

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4. Find the particular solution of the differential equation :

$(1+x^2)\frac{dy}{dx}=e^{m\tan^{-1}x}-y$, given that $y=1$ when $x=0$.

A.

B.

C.

D.

Answer: $y=\frac{e^{m\tan^{-1}x}}{m+1}+(m+1)e^{-\tan^{-1}x}$.

Watch Video Solution

5. Find the particular solution of the differential equation $\frac{dx}{dy}+x\cot y=2y^2\cot y,\ y\neq 0$ given that $x=0\ when\ y=\frac{\pi}{2}$.

A.

B.

C.

D.

Answer: $x = y^2 - \frac{\pi^2}{4}\cos ecy(y \neq 0)$.

Watch Video Solution

6. Find the particular solution of the differential equation $\frac{dy}{dx} + y\cot x = 2x + x^2\cot x(x \neq 0)$given that $y = 0$when $x = \frac{\pi}{2}$.

A.

B.

C.

D.

Answer: $y\sin x = x^2\sin x - \frac{\pi^2}{4}$.

Watch Video Solution

7. Solve the differential equation $(x+2y^2)\frac{dy}{dx}=y$, given that when $x=2,\ y=1$

A.

B.

C.

D.

Answer: $x = 2y^2, 8.$

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EXERCISE 9 (j) Long Answer Type Questions (I)

1. The slope of a curve art each of its points is equal to the square of the abscissa of the point. Find the particular curve through the point (-1,1).

A.

B.

C.

D.

Answer:

Watch Video Solution

2. Find the equation of a curve such that the projection of its ordinate upon the normal is equal to its abscissa.

A.

B.

C.

D.

Watch Video Solution

3. Show that the family of curves for which the slope of the tangent at any point (x, y) on it is $\frac{x^2 + y^2}{2xy}$, is given by $x^2 \quad y^2 = \quad cx$.

A.

B.

C.

D.

Watch Video Solution

4. Find the equation of a curve passing through the point (0, 1). If the slope of the tangent to the curve at any point (x, y) is equal to the sum of the x coordinate (abscissa) and the product of the x coordinate and y coordinate (ordinate) of t

A.

B.

C.

D.

Answer: $1+y=2e^{x^2/2}$.

Watch Video Solution

5. The rate of growth of a population is proportional to the number present if the population of a city doubled in the past 25 years, and the present population is 100000, when will the city have a population of 500000?

A.

B.

C.

D.

Answer: 58 years from now.

Watch Video Solution

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6. It given that the rate at which some bacteria multiply is proportional to the instantaneous number presents. If the original number of bacteria doubles in two hours, in how many hours will it be five times?

A.

B.

C.

D.

Answer: $2\frac{\log 5}{\log 2}$ **hours.**

Watch Video Solution

7. In a culture, the bacteria count is 1,00,000. The number is increased by 10% in 2 hours. In how many hours will the count reach 2,00,000, if the rate of growth of bacteria is proportional to the number present?

A.

B.

C.

D.

Answer: $\frac{2 \log 2}{\log . \frac{11}{10}}$ **hours.**

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8. Radium decomposes at a rate proportional to the quantity of radium present. It is found that in 25 years, approximately $1 \cdot 1$ precent of a certain quantity of radium has decomposed. Determine approximately how long it will take for one-half of the original amount of radium to decompose ?

$(\log_e 0.989 = -0 \cdot 01106, \log_e 2 = 0 \cdot 6931)$

A.

B.

C.

D.

Answer: 1567 years app.

Watch Video Solution

9. If is known that, if the interest i s compounded continuously, the principal changes f the rate equal to the product of the rate of bak interest per annum, and the principal. If the interest is compounded continuously at 5% per annum, in how many years will Rs. 100 double itself? At what interest rate will Rs. 100 double itself in 10 years $\left((\log)_e 2 = 0.6931\right)$ How much will Rs. 1000 be worth at 5% interest after 10 years? $\left(e^{0.5} = 1.648\right)$.

A.

B.

C.

D.

Answer: (i) $6 \cdot 9\,\%$ **(ii) Rs. 1648.**

Watch Video Solution

10. Water at temperature 100^0C coos in 10 minutes 80^0C in a room of temperature 25^0C . Find The temperature of water after 20 minutes The time when the temperature is 40^0C [Given: $(\log)_e \frac{11}{15} = -0.3101, \log 5 = 1.6094$]

A.

B.

C.

D.

Answer: (i) $65 \cdot 34^\circ C$ **(ii) 52 min approx.**

Watch Video Solution

11. Find the equation of a curve passing through the point (0, 2) given that the sum of the coordinates of any point on the curve exceeds the magnitude of the slope of the tangent to the curve at that point by 5.

A.

B.

C.

D.

Answer: $y = 4 - x - 2e^x$

Watch Video Solution

Objective Type Questions (A. Multiple Choice Questions) (Questions from NCERT Textbook:)

1. The degree of the differential equation $\left(\frac{d^2y}{dx^2}\right)^3 + \left(\frac{dy}{dx}\right)^2 + \sin\left(\frac{dy}{dx}\right) + 1 = 0$(A) 3 (B) 2 (C) 1 (D) not defined

A. 3

B. 2

C. 1

D. not defined

Answer: D

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2. The order of the differential equation $2x^2 \frac{d^2y}{dx^2} - 3\frac{dy}{dx} + y = 0$ is (A) 2 (B) 1 (C) 0 (D) not defined

A. 2

B. 1

C. 0

D. not defined

Answer: A

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3. The number of arbitrary constants in the general solution of a differential equation of fourth order are: (A) 0 (B) 2 (C) 3 (D) 4

A. 0

B. 2

C. 3

D. 4

Answer: D

Watch Video Solution

4. The number of arbitrary constants in the particular solution of differential equation of third order is

A. 3

B. 2

C. 1

D. 0

Answer: D

Watch Video Solution

5. Which of the following differential equations has $y = c_1 e^{x} + c_2 e^{-x}$ as the general solution ?

A. $\frac{d^2y}{dx^2} + y = 0$

B. $\frac{d^2y}{dx^2} - y = 0$

C. $\frac{d^2y}{dx^2} + 1 = 0$

D. $\frac{d^2y}{dx^2} - 1 = 0$

Answer: B

Watch Video Solution

6. Which of the following differential equations has y = x as one of its particular solution?(A) $\frac{d^2y}{dx^2}-x^2\frac{dy}{dx}+xy=x$ (B) $\frac{d^2y}{dx^2}+x\frac{dy}{dx}+xy=x$ (C) $\frac{d^2y}{dx^2}-x^2\frac{dy}{dx}+xy=0$ (D) `(d^2y)/(dx^2)+x(dy)/(dx)+x y=0

A. $\frac{d^2y}{dx^2}-x^2\frac{dy}{dx}+xy=x$

B. $\frac{d^2y}{dx^2}+x\frac{dy}{dx}+xy=x$

C. $\frac{d^2y}{dx^2}-x^2\frac{dy}{dx}+xy=0$

D. $\frac{d^2y}{dx^2}+x\frac{dy}{dx}+xy=0$

Answer: C

Watch Video Solution

7. The general solution of the differential equation $\frac{dy}{dx}=e^{x+y}$is(A) $e^x+e^{-y}=C$ (B) $e^x+e^y=C$(C) $e^{-x}+e^y=C$ (D) $e^{-x}+e^{-y}=C$

A. $e^x + e^{-y} = c$

B. $e^x + e^y = c$

C. $e^{-x} + e^y = c$

D. $e^{-x} + e^{-y} = c$

Answer: A

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8. Which of the following differential equation cannot be solved, using variable separable method :

A. $\frac{dy}{dx} = e^{x+y} + e^{-x+y}$

B. $(y^2 - 2xy)dx = (x^2 - 2xy)dy$

C. $xy\frac{dy}{dx} = 1 + x + y + xy$

D. $\frac{dy}{dx} + y = 2.$

Answer: B

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9. A homogeneous differential equation of the from $\frac{dx}{dy} = h\left(\frac{x}{y}\right)$ can be solved by making the substitution.(A) $y = vx$ (B) $v = yx$ (C) $x = vy$ (D) $x = v$

A. $y = vx$

B. $v = yx$

C. $x = vy$

D. $x = v$

Answer: C

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10. Which of the following is a homogeneous differential equation?(A) $(4x + 6y + 5)dy(3y + 2x + 4)dx = 0$(B) $(xy)dx - (x^3 + y^3)dy = 0$(C) $(x^3 + 2y^2)dx + 2xydy = 0$(D) $y^2dx + (x^2 - xy - y^2)dy = 0$

A. $(4x+6y+5)dy-(3y+2x+4)dx=0$

B. $xydx-(x^3+y^3)dy=0$

C. $(x^3+2y^2)dx+2xydy=0$

D. $y^2dx+(x^2-xy-y^2)dy=0.$

Answer: D

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11. The Integrating Factor of the differential equation $x\frac{dy}{dx}-y=2x^2$ is(A) e^{-x} (B) e^{-y} (C) $\frac{1}{x}$ (D) x

A. e^{-x}

B. e^{-y}

C. $\frac{1}{x}$

D. x

Answer: C

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12. What is the integrating factor of the differential equation $\left(1-y^2\right)\frac{dx}{dy}=ay(-1<y<1)$?

A. $\frac{1}{y^2-1}$

B. $\frac{1}{\sqrt{y^2-1}}$

C. $\frac{1}{1-y^2}$

D. $\frac{1}{\sqrt{(1-y^2)}}$

Answer: D

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13. The general solution of the differential equation $\frac{ydx-xdy}{y}=0$ is :

A. $xy=c$

B. $x=cy^2$

C. $y = cx$

D. $y = cx^2$.

Answer: C

Watch Video Solution

14. The general solution of a differential equation of the type $\frac{dx}{dy} + P_1 x = Q_1$ is (A) $ye^{\int P_1 dy} = \int \left(Q_1 e^{\int P_1 dy}\right) dy + C$ (B) $y\dot{e}^{\int P_1 dx} = \int \left(Q_1 e^{\int P_1 dx}\right) dx + C$ (C) $xe^{\int P_1 dy} = \int \left(Q_1 e^{\int P_1 dy}\right) dy + C$ (D)

`x e^(intP_1dx)

A. $ye^{\int P_1 dy} = \int \left(Q_1 e^{\int P_1 dy}\right) dy + c$

B. $ye^{\int P_1 dx} = \int \left(Q_1 e^{\int P_1 dx}\right) dx + c$

C. $xe^{\int P_1 dy} = \int \left(Q_1 e^{\int P_1 dy}\right) dy + c$

D. $xe^{\int P_1 dx} = \int \left(Q_1 e^{\int P_1 dx}\right) dx + c$

Answer: C

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15. The general solution of the differential equation $ex \quad dy \quad + \quad (y \quad ex \quad + \quad 2x) \quad dx \quad = \quad 0$ is (A) $xey + x^2 = C$ (B) $xey + y^2 = C$ (C) $yex + x^2 = C$ (D) $yey + x^2 = C$

A. $xe^y + x^2 = c$

B. $xe^y + y^2 = c$

C. $ye^x = x^2 = c$

D. $ye^y + x^2 = c$.

Answer: C

Watch Video Solution

16. The degree of the differential equation representing the family of curves $(x - a)^2 + y^2 = 16$ is :

A. 0

B. 2

C. 3

D. 1

Answer: D

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Objective Type Questions (A. Multiple Choice Questions) (Questions from NCERT Exemplar:)

1. The degree of the differential equation

$$\frac{d^2y}{dx^2}+3\left(\frac{dy}{dx}\right)^2=x^2\log\left(\frac{d^2y}{dx^2}\right),$$ is

A. 1

B. 2

C. 3

D. not defined

Answer: D

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2. The order and degree of differential equation: $\left[1+\left(\frac{dy}{dx}\right)^2\right]=\frac{d^2y}{dx^2}$ are

A. 1, 2

B. 2, 2

C. 2, 1

D. 4, 2

Answer: C

Watch Video Solution

3. The solution of the differential equation :

$2x\frac{dy}{dx}-y=3$ represents a family of :

A. straight lines

B. circles

C. parabolas

D. ellipses.

Answer: C

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4. The solution of the differential equation $\left(\frac{dy}{dx}\right)^2 - x\left(\frac{dy}{dx}\right) + y = 0$ is

A. $y = 2$

B. $y = 2x$

C. $y = 2x - 4$

D. $y = 2x^2 - 4$.

Answer: C

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5. The solution of the diffferential equation

$x\frac{dy}{dx}+2y=x^2$ is

A. $y=\frac{x^2c}{4x^2}$

B. $y=\frac{x^2}{4}+c$

C. $y=\frac{x^4+c}{x^2}$

D. $y=\frac{x^4+c}{4x^2}$

Answer: D

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Objective Type Questions (A. Multiple Choice Questions) (For Board Examinations :)

1. Degree of differential equation $\frac{d^2y}{dx^2}+\left(\frac{dy}{dx}\right)^3+y=0$ is :

A. 3

B. 2

C. 1

D. 0

Answer: C

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2. $\frac{dy}{dx} - \cos x = 0$

A. 0

B. 1

C. not defined

D. 2

Answer: B

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3. Find the order and degree of $y''' + y^2 + e^{y'} = 0$

A. 2

B. 1

C. 3

D. not defined

Answer: C

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4. Find the order and degree of $y''' + y^2 + e^{y'} = 0$

A. 2

B. 1

C. 3

D. not defined

Answer: D

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5. The order of the differential equation $2x^2\frac{d^2y}{dx^2}-3\frac{dy}{dx}+y=0$ is (A) 2 (B) 1 (C) 0 (D) not defined

A. 2

B. 0

C. 1

D. None of these

Answer: A

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6. what is the degree of the differential equation

$$\frac{d^3y}{dx^3 + 2\left(\frac{d^2y}{dx^2}\right)^2 - \frac{dy}{dx} = y = 0}\ ?$$

A. -3

B. 2

C. 1

D. None of these

Answer: B

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7. The degree and order of the differential equation :

$2\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + y = 0$ is :

A. (2, 1)

B. (1, 2)

C. (2, 2)

D. Not defined

Answer: A

Watch Video Solution

8. What is the integrating factor of the differential equation $(1-y^2)\frac{dx}{dy}=ay(-1<y<1)$?

A. $\frac{1}{y^2-1}$

B. $\frac{1}{\sqrt{y^2-1}}$

C. $\frac{1}{1-y^2}$

D. $\frac{1}{\sqrt{(1-y^2)}}$

Answer: D

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9. Integrating factor of differential equation :

$\frac{dy}{dx} + y = 3$ is :

A. x

B. e

C. e^{x}

D. $\log x.$

Answer: C

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10. Order and degree of the differential equation

$\frac{d^2y}{d^2} + 2\frac{dy}{dx} + \sin y = 0$ are

A. 1

B. 2

C. 3

D. Not defined.

Answer: A

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11. Find the order and degree, if defined, of each of the following differential equations: (i) $\frac{dy}{dx} - \cos x = 0$ (ii) $xy\frac{d^2y}{dx^2} + x\left(\frac{dy}{dx}\right)^2 - y\frac{dy}{dx} = 0$ (iii) $y^m + y^2 + e^{y'} = 0$

A. 2

B. 3

C. 1

D. None of these

Answer: C

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12. The solution of the differential equation :

$\frac{dy}{dx} = e^x + 1$ is :

A. $y = e^x + c$

B. $y = xe^x + c$

C. $y = x + e^x + c$

D. $y = xe^x + x + c.$

Answer: C

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13. The order of the differential equation $2x^2 \frac{d^2y}{dx^2} - 3\frac{dy}{dx} + y = 0$ is (A) 2 (B) 1 (C) 0 (D) not defined

A. 0

B. 1

C. 2

D. 3

Answer: C

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14. The degree of the differential equation :

$$xy\left(\frac{d^2y}{dx^2}\right)^2 + x^4\left(\frac{dy}{dx}\right)^3 - y\frac{dy}{dx} = 0 \text{ is :}$$

A. 4

B. 3

C. 2

D. 1

Answer: C

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15. Order of the differential equation :

$$\frac{d^2y}{dx^2} - \left(\frac{dy}{dx}\right)^3 + 3y = 0 \text{ is :}$$

A. 3

B. 2

C. 0

D. 1

Answer: B

Watch Video Solution

16. The order of the differential equation $2x^2\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + y = 0$ is (A) 2 (B) 1 (C) 0 (D) not defined

A. 1

B. 2

C. 3

D. cannot be defined.

Answer: A

Watch Video Solution

17. The general solution of the differential equation $\frac{dy}{dx} = e^{x+y}$is(A) $e^x + e^{-y} = C$ (B) $e^x + e^y = C$(C) $e^{-x} + e^y = C$ (D) $e^{-x} + e^{-y} = C$

A. $e^{-x} + e^{-y} = c$

B. $e^x + e^{-y} = c$

C. $e^x + e^y = c$

D. $e^{-x} + e^y = c.$

Answer: B

Watch Video Solution

18. The integrating factor of the differential equation :

$\frac{dx}{dy} + \frac{x}{y} = y$ is :

A. log y

B. y

C. e^y

D. None of these

Answer: B

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19. The degree of the differential equation :

$\left(1 + \frac{dy}{dx}\right)^5 = \left(\frac{d^2y}{dx^2}\right)^2$ is :

A. 1

B. 2

C. 3

D. 4

Answer: B

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Objective Type Questions (B. Fill in the blanks)

1. The degree of the differential equation :

$x^2\left(\frac{d^2y}{dx^2}\right)^3 + y\left(\frac{dy}{dx}\right)^4 + x^3 = 0$ is ________.

A.

B.

C.

D.

Answer: 3

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2. Order and degree of the differential equation

$\left(\frac{ds}{dt}\right) + 3s\frac{d^2s}{dt^2} = 0$ are

A.

B.

C.

D.

Answer: 2, 1

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3. D.E. of lines, passing through the origin, is

A.

B.

C.

D.

Answer: $\frac{dy}{dx} = \frac{y}{x}$

Watch Video Solution

4. Show that the differential equation of which $y = 2(x^2 - 1) + ce^{-x}$ ^ 2 is a solution, is $\frac{dy}{dx} + 2xy = 4x^3$.

A.

B.

C.

D.

Answer: $\frac{dy}{dx} + 2xy = 4x^3$

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5. General solution of $\left(x^2+1\right)\frac{dy}{dx}=2$ is ________ .

A.

B.

C.

D.

Answer: $y=2\tan^{-1}x+c$

Watch Video Solution

6. Solve $\frac{dy}{dx}=\sqrt{4-y^2}$

A.

B.

C.

D.

Answer: $\sin^{-1}.\frac{y}{2}=x+c$

Watch Video Solution

7. The general solution of the differential equation $\frac{dy}{dx}=\frac{y}{x}$ is

A.

B.

C.

D.

Answer: $y=cx$

Watch Video Solution

8. Solve $\frac{dy}{dx}=\frac{x-y}{x+y}$

A.

B.

C.

D.

Answer: homogeneous

Watch Video Solution

9. $(x \log x) \frac{dy}{dx} + y = 2 \log x$

A.

B.

C.

D.

Answer: $\log x$

Watch Video Solution

10. Solve $\left[\frac{e^{-2\sqrt{x}}}{\sqrt{x}}-\frac{y}{\sqrt{x}}\right]\frac{dx}{dy}=1(x \ne 0$

A.

B.

C.

D.

Answer: $e^{2\sqrt{x}}$.

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Objective Type Questions (C. True/False Questions)

1. The order of the differential equation :

$\log\left(\frac{d^2y}{dx^2}\right)=\left(\frac{dy}{dx}\right)^3+x$ is 3.

A.

B.

C.

D.

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2. Show that $y = A\cos x + B\sin x$ is a solution of differential equation $\frac{d^2y}{dx^2} + y = 0.$

A.

B.

C.

D.

Watch Video Solution

3. Solve the differential equation $\frac{dy}{dx} = \sin^{-1} x$

A.

B.

C.

D.

Answer: 1

Watch Video Solution

4. Show that the differential equation $\frac{dy}{dx} = \frac{y - x}{y + x}$ is homogenous and solve it.

A.

B.

C.

D.

Answer: 1

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5. Solve the differential equation : $x\frac{dy}{dx}+3y=\frac{\log x}{x^3}$.

A.

B.

C.

D.

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Objective Type Questions (D. Very short Answer Type Questions) (Answer the following questions:)

1. $\frac{dy}{dx}=e^{x+y}$

A.

B.

C.

D.

Answer: $e^x + e^{-y} = c$

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2. Determine the order and degree of the differential equation :

$$\left(\frac{dy}{dx}\right)^3 - 2y\frac{d^2y}{dx^2} = 0.$$

A.

B.

C.

D.

Answer: Order = 2 ; Degree = 1

Watch Video Solution

3. Find the integrating factor of the differential equation :

$$y\frac{dx}{dy} - 2x = y^3 e^{-y}.$$

A.

B.

C.

D.

Answer: $\frac{1}{y^2}$

Watch Video Solution

4. Form the differential equation representing the family of curves $ax + by = 0$, when 'a' and 'b' are arbitrary constants.

A.

B.

C.

D.

Answer: $\dfrac{d^2y}{dx^2} = 0$

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5. Find the order and degree of the differential equation :

$$x^2 \frac{d^2y}{dx^2} = \left[1 + \left(\frac{dy}{dx}\right)^2\right]^4.$$

A.

B.

C.

D.

Answer: Order = 2 ; Degree = 1

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6. Write the degree of the differential equation $x^3\left(\frac{d^2y}{dx^2}\right)^2 + x\left(\frac{dy}{dx}\right)^4 = 0.$

A.

B.

C.

D.

Answer: Order = Degree = 2

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7. Form the differential equation representing the family of curves $y = \frac{A}{x} + 5$, by eliminating the arbitrary constant A.

A.

B.

C.

D.

Answer: $x\frac{dy}{dx}+y=5$

Watch Video Solution

8. Solve the differential equation $\left(\tan^{-1}y-x\right)dy=\left(1+y^2\right)dx.$

A.

B.

C.

D.

Answer: $e^{\tan - 1y}$

Watch Video Solution

9. Form the differential equation representing the family of curves $y = A \sin x$, by eliminating the arbitrary constant A.

A.

B.

C.

D.

Answer: $\frac{dy}{dx} = y \cot x$

Watch Video Solution

10. Solve : $dy = \sin x dx$.

A.

B.

C.

D.

Answer: $y = -\cos x + c$

Watch Video Solution

11. Find the order and degree of the differential equation $\frac{d^2y}{dx^2} - y\left(\frac{dy}{dx}\right)^2 - 6y = 0.$

A.

B.

C.

D.

Answer: Order $= 2$**; Degree** $= 1$

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12. Solve the following differential equation: $\cos^2 x \frac{dy}{dx} + y = \tan x$

A.

B.

C.

D.

Answer: (a) 1 (b) $e^{\tan x}$

Watch Video Solution

13. Order and degree of the differential equation

$\left(\frac{ds}{dt}\right) + 3s\frac{d^2s}{dt^2} = 0$ are

A.

B.

C.

D.

Answer: Order $=2$**; Degree** $=1$

Watch Video Solution

14. Find the sum of the order and degree of the differential equation $y=x\left(\frac{dy}{dx}\right)^3+\frac{d^2y}{dx^2}$.

A.

B.

C.

D.

Answer: 3

Watch Video Solution

15. If $\sin x$ is an integrating factor of the differential equation $\frac{dy}{dx} + Py = Q$, then write the value of P.

A.

B.

C.

D.

Answer: $\cot x$

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16. Write the order of the differential equation representing the family of curves $y = kx + k^4$.

A.

B.

C.

D.

Answer: 4

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17. Find the general solution of :

$$\frac{dy}{dx} = x^2 + \sin 3x.$$

A.

B.

C.

D.

Answer: $y = \frac{x^3}{3} - \frac{\cos 3x}{3} + c$

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18. Write the particular solution of the differential equation : $\frac{dy}{dx} = \sin x$, given that $y(\pi) = 2$.

A.

B.

C.

D.

Answer: $y = 1 - \cos x$

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19. Solve the following differential equation: $dy + (x + 1)(y + 1)dx = 0$

A.

B.

C.

D.

Answer: $\log|y+1| + \frac{x^2}{2} + x + c$

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20. Solve : $e^y dx + e^x dy = 0.$

A.

B.

C.

D.

Answer: $e^{-x} + e^{-y} = c$

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21. Solve the differential equation :

$$(x+y)\frac{dy}{dx}=1.$$

A.

B.

C.

D.

Answer: e^{-y}

Watch Video Solution

22. Solve the following differential equations : $\frac{dy}{dx}+2y=3.$

A.

B.

C.

D.

Answer: $-\frac{1}{2}\log(3-2y)=x+c$

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23. Solve the following differential equations :

$$\frac{dy}{dx}+y=x.$$

A.

B.

C.

D.

Answer: $y=(x-1)+ce^{-x}$

Watch Video Solution

24. Solve the following differential equations :

$$\frac{dy}{dx} - y = 3x^3.$$

A.

B.

C.

D.

Answer: $y + 3\left(x^3 + 3x^2 + 6x + 6\right) = ce^x$

Watch Video Solution

25. Solve the following differential equations :

$$\frac{dy}{dx} + 3y = 2x.$$

A.

B.

C.

D.

Answer: $y = \frac{2}{3}x - \frac{2}{9} + ce^{-3x}$.

Watch Video Solution

NCERT - FILE (Questions from NCERT Book) (Exercise 9.1)

1. Determine order and degree (if defined) of differential equations given

$$\frac{d^4y}{dx^4} + \sin(y'{}'{}') = 0$$

A.

B.

C.

D.

Answer: $\begin{array}{ll} \text{Order} & \text{Degree} \\ 4 & \text{Not a polynomial in derivatives} \end{array}$

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2. Determine order and degree (if defined) of differential equations given

$y' + 5y = 0$

A.

B.

C.

D.

Answer:

Order	Degree
1	1

Watch Video Solution

3. Determine order and degree (if defined) of differential equations given

$$\left(\frac{ds}{dt}\right)^4 + 3s\frac{d^2s}{dt^2} = 0$$

A.

B.

C.

D.

Answer: $\begin{matrix} \text{Order} & \text{Degree} \\ 2 & 1 \end{matrix}$

Watch Video Solution

4. Determine order and degree (if defined) of differential equations given

$$\left(\frac{d^2y}{dx^2}\right)^2 + \cos\left(\frac{dy}{dx}\right) = 0$$

A.

B.

C.

D.

Answer: $\begin{matrix} \text{Order} & \text{Degree} \\ 2 & \text{Not a polynomial in derivatives} \end{matrix}$

Watch Video Solution

5. Determine order and degree (if defined) of differential equations given

$$\frac{d^2y}{dx^2} = \cos 3x + \sin 3x$$

A.

B.

C.

D.

Answer: $\begin{array}{cc} \text{Order} & \text{Degree} \\ 2 & 1 \end{array}$

Watch Video Solution

6. Determine order and degree (if defined) of differential equations given

$$(y^m)^2 + (y'')^3 + (y')^4 + y^5 = 0$$

A.

B.

C.

D.

Answer: $\begin{array}{cc} \text{Order} & \text{Degree} \\ 3 & 2 \end{array}$

Watch Video Solution

7. Determine order and degree (if defined) of differential equations :

$y''' + 2y'' + y' = 0.$

A.

B.

C.

D.

Answer: $\begin{array}{cc} \text{Order} & \text{Degree} \\ 3 & 1 \end{array}$

Watch Video Solution

8. Determine order and degree (if defined) of differential equations given

$y' + y = e^x$

A.

B.

C.

D.

Answer: $\begin{matrix} \text{Order} & \text{Degree} \\ 1 & 1 \end{matrix}$

Watch Video Solution

9. Determine order and degree (if defined) of differential equations given

$y'' + (y')^2 + 2y = 0$

A.

B.

C.

D.

Answer: $\begin{array}{cc} \text{Order} & \text{Degree} \\ 2 & 1 \end{array}$

Watch Video Solution

10. Determine order and degree (if defined) of differential equations given

$y'' + 2y' + \sin y = 0$

A.

B.

C.

D.

Answer: $\begin{array}{cc} \text{Order} & \text{Degree} \\ 2 & 1 \end{array}$

Watch Video Solution

11. The degree of the differential equation $\left(\frac{d^2y}{dx^2}\right)^3 + \left(\frac{dy}{dx}\right)^2 + \sin\left(\frac{dy}{dx}\right) + 1 = 0$(A) 3 (B) 2 (C) 1 (D) not defined

A. 3

B. 2

C. 1

D. not defined.

Answer: D

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12. The order of the differential equation $2x^2\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + y = 0$ is (A) 2 (B) 1 (C) 0 (D) not defined

A. 2

B. 1

C. 0

D. not defined

Answer: A

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NCERT - FILE (Questions from NCERT Book) (Exercise 9.2)

1. Verify that the given functions (explicit or implicit) is a solution of the corresponding differential equation:$y = e^x + 1 : y'' - y' = 0$

A.

B.

C.

D.

Watch Video Solution

2. Verify that the given functions (explicit or implicit) is a solution of the corresponding differential equation: $y = x^2 + 2x + C$: $y' - 2x - 2 = 0$

A.

B.

C.

D.

Watch Video Solution

3. Verify that the given functions (explicit or implicit) is a solution of the corresponding differential equation:$y = \cos x + C : y' + \sin x = 0$

A.

B.

C.

D.

Watch Video Solution

4. Verify that the given functions (explicit or implicit) is a solution of the corresponding differential equation:$y=\sqrt{1+x^2}:y' = \frac{xy}{1+x^2}$

A.

B.

C.

D.

Watch Video Solution

5. Verify that the given functions (explicit or implicit) is a solution of the corresponding differential equation :

$y = Ax : xy' = y(x \neq 0)$

A.

B.

C.

D.

Watch Video Solution

6. Verify that the given functions (explicit or implicit) is a solution of the corresponding differential equation:$y = xs \in x$:

$xy' = y + x\sqrt{x^2 - y^2}(x \neq 0\text{and}x > y \text{ or } x < y)$

A.

B.

C.

D.

Watch Video Solution

7. Verify that the given functions (explicit or implicit) is a solution of the corresponding differential equation: $xy = \log y + C$: $y' = \frac{y^2}{1 - xy}(xy \neq 1)$

A.

B.

C.

D.

Watch Video Solution

8. Verify that the given functions (explicit or implicit) is a solution of the corresponding differential equation:$y \cos y = x$: (y sin y + cos y + x) y = y

A.

B.

C.

D.

Watch Video Solution

9. Verify that the given functions (explicit or implicit) is a solution of the corresponding differential equation:$x + y = \tan^{-1} y$: $y^2 y' + y^2 + 1 = 0$

A.

B.

C.

D.

Watch Video Solution

10. Verify that the given functions (explicit or implicit) is a solution of the corresponding differential equation: $y = \sqrt{a^2 - x^2} x \in (-x, a)$: $x + y\frac{dy}{dx} = 0 (y \neq 0)$

A.

B.

C.

D.

Watch Video Solution

11. The number of arbitrary constants in the general solution of a differential equation of fourth order are: (A) 0 (B) 2 (C) 3 (D) 4

A. 0

B. 2

C. 3

D. 4

Answer: D

Watch Video Solution

12. The number of arbitrary constants in the particular solution of differential equation of third order is

A. 3

B. 2

C. 1

D. 0

Answer: D

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NCERT - FILE (Questions from NCERT Book) (Exercise 9.3)

1. Form a differential equation representing the given family of curves by eliminating arbitrary constants a and b. $\frac{x}{a}+\frac{y}{b}=1$

A.

B.

C.

D.

Watch Video Solution

2. Form a differential equation representing the given family of curves by eliminating arbitrary constants a and b. $y^2 = a(b^2 - x^2)$

A.

B.

C.

D.

Watch Video Solution

3. Form a differential equation representing the given family of curves by eliminating arbitrary constants a and b. $y = ae^{3x} + be^{-2x}$

A.

B.

C.

D.

Watch Video Solution

4. Form a differential equation representing the given family of curves by eliminating arbitrary constants a and b.$y = e^{2x}(a + bx)$

A.

B.

C.

D.

Watch Video Solution

5. $y = e^{x}(a \cos x + b \sin x)$

A.

B.

C.

D.

Watch Video Solution

6. Form the differential equation of the family of circles touching the y-axis at origin.

A.

B.

C.

D.

Watch Video Solution

7. Form the differential equation of the family of parabolas having vertex at origin and axis along positive y-axis.

A.

B.

C.

D.

Watch Video Solution

8. Form the differential equation of the family of ellipses having foci on y-axis and centre at origin.

A.

B.

C.

D.

Watch Video Solution

9. Form the differential equation of the family of hyperbolas having foci on x-axis and centre at origin.

A.

B.

C.

D.

Watch Video Solution

10. Form the differential equation of the family of circles having centre on y-axis and radius 3 units.

A.

B.

C.

D.

Watch Video Solution

11. Which of the following differential equations has $y=c_1e^x+c_2e^{-x}$ as the general solution ?

A. $\frac{d^2y}{dx^2}+y=0$

B. $\frac{d^2y}{dx^2}-y=0$

C. $\frac{d^2y}{dx^2}+1=0$

D. $\frac{d^2y}{dx^2}-1=0$

Answer: B

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12. Which of the following differential equations has y = x as one of its particular solution?(A) $\frac{d^2y}{dx^2} - x^2\frac{dy}{dx} + xy = x$ (B) $\frac{d^2y}{dx^2} + x\frac{dy}{dx} + xy = x$ (C) $\frac{d^2y}{dx^2} - x^2\frac{dy}{dx} + xy = 0$ (D) `(d^2y)/(dx^2)+x(dy)/(dx)+x y=0

A. $\frac{d^2y}{dx^2} - x^2\frac{dy}{dx} + xy = x$

B. $\frac{d^2y}{dx^2} + x\frac{dy}{dx} + xy = x$

C. $\frac{d^2y}{dx^2} - x^2\frac{dy}{dx} + xy = 0$

D. $\frac{d^2y}{dx^2} + x\frac{dy}{dx} + xy = 0.$

Answer: C

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NCERT - FILE (Questions from NCERT Book) (Exercise 9.4)

1. Find the general solution of the differential equations $\frac{dy}{dx} = \frac{1 - \cos x}{1 + \cos x}$

A.

B.

C.

D.

Answer:

Watch Video Solution

2. General solution of $x^2 \frac{dy}{dx} + \sqrt{4 - y^2} = 0$ is

A.

B.

C.

D.

Watch Video Solution

3. Find the general solution of the differential equations $\frac{dy}{dx}+y=1(y\ne 1)$

A.

B.

C.

D.

Watch Video Solution

4. $\sec^2 \tan y dx+\sec^2 y \tan x dy=dy=0$

A.

B.

C.

D.

Watch Video Solution

5. Find the general solution of the differential equations $\left(e^{x}+e^{-x}\right)dy-\left(e^{x}-e^{-x}\right)dx=0$

A.

B.

C.

D.

Answer:

Watch Video Solution

Watch Video Solution

6. Find the general solution of the differential equations $\frac{dy}{dx} = (1 + x^2)(1 + y^2)$

A.

B.

C.

D.

Watch Video Solution

7. $y \log y dx - x dy = 0$

A.

B.

C.

D.

Watch Video Solution

8. Find the general solution . $x^5 \frac{dy}{dx} = -y^5$.

A.

B.

C.

D.

Answer:

Watch Video Solution

9. Find the general solution of the differential equation

$\frac{dy}{dx} = \sin^{-1} x$.

A.

B.

C.

D.

Watch Video Solution

10. Solve the differential equation $e^x \tan y dx + (1 - e^x) \sec^2 y dy = 0$

A.

B.

C.

D.

Answer:

Watch Video Solution

11. The differential equations, find a particular solution satisfying the given condition: $\left(x^3 + x^2 + x + 1\right)\frac{dy}{dx} = 2x^2 + x; y = 1$when $x = 0$

A.

B.

C.

D.

Watch Video Solution

12. The differential equations, find a particular solution satisfying the given condition: $x\left(x^2 - 1\right)\frac{dy}{dx} = 1; y = 0$when $x = 2$

A.

B.

C.

D.

Answer:

Watch Video Solution

13. The differential equations, find a particular solution satisfying the given condition: $\cos\left(\frac{dy}{dx}\right) = a(a \in R); y = 1$

A.

B.

C.

D.

Answer:

Watch Video Solution

14. The differential equations, find a particular solution satisfying the given condition: $\frac{dy}{dx} = y \tan x; y = 1$when x = 0

A.

B.

C.

D.

Watch Video Solution

15. Find the equation of a curve passing through the point (0, 0) and whose differentialequation is $y' = ex \sin x$

A.

B.

C.

D.

Answer:

Watch Video Solution

16. For the differential equation $xy\frac{dy}{dx} = (x+2)(y+2)$, find the solution curve passing through the point $(1, 1)$.

A.

B.

C.

D.

Answer:

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17. Find the equation of the curve passing through the point (0, -2) given that at any point (x, y) on the curve the product of the slope of its tangent and y coordinate of the point is equal to the x-coordinate of the point.

A.

B.

C.

D.

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18. At any point $P(x, y)$ of a curve, the slope of the tangent is twice the slope of the line segment joining the point of contact P to the point $(-4, -3)$ Find the equation of the curve given that it passes through the point $(-2, 1)$

A.

B.

C.

D.

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19. The volume of spherical balloon being inflated changes at a constant rate. If initially its radius is 3 units and after 3 seconds it is 6 units. Find the radius of balloon after t seconds.

A.

B.

C.

D.

Answer: $r = [9(7t + 3)]^{1/3}$**, which is the radius after 't' seconds.**

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20. In a bank, principal increases continuously at the rate of r% per year. Find the value of r if Rs 100 double itself in 10 years $\left(\log e^2 = 0.6931\right)$

A.

B.

C.

D.

Answer: $r = 6.931\,\%$.

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21. In a bank, principal increases continuously at the rate of 5% per year. An amountof Rs 1000 is deposited with this bank, how much will it worth after 10 years $\left(e^{0.5} = 1.648\right)$

A.

B.

C.

D.

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22. In a culture, the bacteria count is 1,00,000. The number is increased by 10% in 2 hours. In how many hours will the count reach 2,00,000, if the rate of growth of bacteria is proportional to the number present?

A.

B.

C.

D.

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23. $\frac{dy}{dx} = e^{x+y}$

A. $e^{x} + e^{-y} = C$

B. $e^{x} + e^{y} = C$

C. $e^{-x} + e^{-y} = C$

D. $e^{-x} + e^{-y} = C$

Answer: A

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NCERT - FILE (Questions from NCERT Book) (Exercise 9.5)

1. $(x^2 + xy)dy = (x^2 + y^2)dx$

A.

B.

C.

D.

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2. Show that the given differential equation is homogeneous and solve each of them. $y' = \frac{x+y}{x}$

A.

B.

C.

D.

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3. Show that the given differential equation is homogeneous and solve each of them. (x y) dy (x + y) dx = 0

A.

B.

C.

D.

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4. Show that the given differential equation is homogeneous and solve each of them. $(x^2 - y^2)dx + 2xydy = 0$

A.

B.

C.

D.

Watch Video Solution

5. Show that the given differential equation is homogeneous and solve each of them. $x^2\frac{dy}{dx} = x^2 - 2y^2 + xy$

A.

B.

C.

D.

Watch Video Solution

6. Show that the given differential equation is homogeneous and solve each of them. $xdy - ydx = \sqrt{x^2 + y^2}dx$

A.

B.

C.

D.

Watch Video Solution

7. Show that the given differential equation is homogeneous and solve each of them.

$$\left\{x\cos\left(\frac{y}{x}\right)+y\sin\left(\frac{y}{x}\right)\right\}ydx=\left\{y\sin\left(\frac{y}{x}\right)-\cos\left(\frac{y}{x}\right)\right\}xdy$$

A.

B.

C.

D.

Answer:

Watch Video Solution

8. Show that the given differential equation is homogeneous and solve each of them.$x\frac{dy}{dx} - y + x\sin\left(\frac{y}{x}\right) = 0$

A.

B.

C.

D.

Watch Video Solution

9. Show that the given differential equation is homogeneous and solve each of them.$ydx + x\log\left(\frac{y}{x}\right)dy - 2xdy = 0$

A.

B.

C.

D.

Watch Video Solution

10. Show that the given differential equation is homogeneous and solve each of them. $\left(1+e^{\frac{x}{y}}\right)dx+e^{\frac{x}{y}}\left(1-\frac{x}{y}\right)dy=0$

A.

B.

C.

D.

Watch Video Solution

11. The differential equations , find the particular solution satisfying the given condition: (x + y) dy + (x y) dx = 0; y = 1 when x = 1

A.

B.

C.

D.

Watch Video Solution

12. The differential equations , find the particular solution satisfying the given condition:$x^2 dy + (xy + y^2) dx = 0$; y = 1 when x = 1

A.

B.

C.

D.

Watch Video Solution

13. The differential equations , find the particular solution satisfying the given condition: $\left[x\sin^2\left(\frac{y}{x}\right)-y\right]dx+xdy=0;\ y=\frac{\pi}{4}$ when x = 1

A.

B.

C.

D.

Watch Video Solution

14. The differential equations , find the particular solution satisfying the given condition: $\frac{dy}{dx}-\frac{y}{x}+\cos ec\left(\frac{y}{x}\right)=0;\ y=0$ when x = 1

A.

B.

C.

D.

Watch Video Solution

15. The differential equations , find the particular solution satisfying the given condition:$2xy + y^2 - 2x^2 \frac{dy}{dx} = 0; y = 2$when x = 1

A.

B.

C.

D.

Watch Video Solution

16. A homogeneous differential equation of the from $\frac{dx}{dy} = h\left(\frac{x}{y}\right)$ can be solved by making the substitution.(A) $y = vx$ (B) $v = yx$ (C) $x = vy$ (D) $x = v$

A. $y = vx$

B. $v = yx$

C. $x = vy$

D. $x = v$

Answer: C

Watch Video Solution

NCERT - FILE (Questions from NCERT Book) (Exercise 9.6)

1. $\frac{dy}{dx} + 2y = \sin x$

A.

B.

C.

D.

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2. Solve: $\frac{dy}{dx} + 3y = e^{-2x}$

A.

B.

C.

D.

Watch Video Solution

3. The general solution of the DE $\frac{dy}{dx} + \frac{y}{x} = x^2$ is

A.

B.

C.

D.

Watch Video Solution

4. Find the general solution :

$$\frac{dy}{dx} + (\sec x)y = \tan x\left(0 \leq x < \frac{\pi}{2}\right).$$

A.

B.

C.

D.

Watch Video Solution

5. Solve the differential equation

$$\left(\cos^2 x\right)\frac{dy}{dx} + y = \tan x\left(0 \leq x < \frac{\pi}{2}\right)$$

A.

B.

C.

D.

Watch Video Solution

6. Solve $x\dfrac{dy}{dx} + 2y = x^2 \log x$

A.

B.

C.

D.

Watch Video Solution

7. The solution of x log x $\frac{dy}{dx} + y = \frac{2}{x}$ log x is

A.

B.

C.

D.

Watch Video Solution

8. Find the general solution of the differential equations: $\left(1+x^2\right)dy+2xydx=\cot xdx(x\neq 0)$

A.

B.

C.

D.

Watch Video Solution

9. Find the general solution of the differential equations: $x\frac{dx}{dy}+y-x+xy\cot x=0(x\neq 0)$

A.

B.

C.

D.

Watch Video Solution

10. The solution of $(x+y)\frac{dy}{dx}=1$ is

A.

B.

C.

D.

Watch Video Solution

11. $ydx+(x-y^2)dy=0$

A.

B.

C.

D.

Watch Video Solution

12. Solve: $\left(x+3y^2\right)\frac{dy}{dx}=y(y>0)$

A.

B.

C.

D.

Watch Video Solution

13. The differential equations, find a particular solution satisfying the given condition: $\frac{dx}{dy}+2y\tan x=\sin x; y=0$when $x=\frac{\pi}{3}$

A.

B.

C.

D.

Watch Video Solution

14. The differential equations, find a particular solution satisfying the given condition: $\left(1+x^2\right)\frac{dy}{dx}+2xy=\frac{1}{1+x^2}; y=0$when $x=1$

A.

B.

C.

D.

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15. The differential equations, find a particular solution satisfying the given condition: $\frac{dy}{dx} - 3y \cot x = \sin 2x; y = 2 \text{when } x = \frac{\pi}{2}$

A.

B.

C.

D.

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16. Find the equation of a curve passing through the origin given that the slope of the tangent to the curve at any point (x, y) is equal to the sum of

the coordinates of the point.

A.

B.

C.

D.

Watch Video Solution

17. Find the equation of a curve passing through the point (0, 2) given that the sum of the coordinates of any point on the curve exceeds the magnitude of the slope of the tangent to the curve at that point by 5.

A.

B.

C.

D.

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18. The Integrating Factor of the differential equation $x\frac{dy}{dx} - y = 2x^2$ is(A) e^{-x} (B) e^{-y} (C) $\frac{1}{x}$ (D) x

A. e^{-x}

B. e^{-y}

C. $\frac{1}{x}$

D. x

Answer: C

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19. What is the integrating factor of the differential equation $(1-y^2)\frac{dx}{dy} = ay(-1 < y < 1)$?

A. $\frac{1}{y^2 - 1}$

B. $\frac{1}{\sqrt{y^2 - 1}}$

C. $\frac{1}{1 - y^2}$

D. $\frac{1}{\sqrt{(1 - y^2)}}$

Answer: D

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Miscellaneous Exercise on Chapter 9

1. Determine the order and degree of each of the following differential equation. State also whether they are linear or non-linear: $\frac{d^2y}{dx^2} + 5x\left(\frac{dy}{dx}\right) - 6y = \log x$

A.

B.

C.

D.

Watch Video Solution

2. Determine the order and degree of each of the following differential equation. State also whether they are linear or non-linear: $\left(\frac{dy}{dx}\right)^3-4\left(\frac{dy}{dx}\right)^2+7y=s\in x$

A.

B.

C.

D.

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3. Find the order and degree (if defined) of the equation: $\frac{d^4y}{dx^4} - \sin\left(\frac{d^3y}{dx^3}\right) = 0$

A.

B.

C.

D.

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4. For each of the exercises given below, verify that the given function (implicit or explicit) is a solution of the corresponding differential equation.(i) $y = ae^x + be^{-x} + x^2 : x\frac{d^2y}{dx^2} + 2y\frac{dy}{dx} - xy + x^2 - 2 = 0$

(ii) `y=e^x(acosx+bsin

A.

B.

C.

D.

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5. The differential equation for $y = e^x(a\cos x + b\sin x)$ is

A.

B.

C.

D.

Watch Video Solution

6. For each of the exercises given below, verify that the given function (implicit or explicit) is a solution of the corresponding differential equation.

$$y = x \sin 3x \quad : \quad \frac{d^2y}{dx^2} + 9y - 6\cos 3x = 0$$

A.

B.

C.

D.

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7. if $x^2 = 2y^2 \log y$ then prove $\left(x^2 + y^2\right)\frac{dy}{dx} - xy = 0$

A.

B.

C.

D.

Watch Video Solution

8. Form the differential equation representing the family of curves given by $(x-a)^2+2y^2=a^2$, where a is an arbitrary constant.

A.

B.

C.

D.

Watch Video Solution

9. Prove that $x^2 - y^2 = c(x^2 + y^2)^2$ is the general solution of differential equation $(x^3 - 2xy^2)dx = (y^3 - 3x^2y)dy$, where c is a parameter.

A.

B.

C.

D.

Watch Video Solution

10. Form the differential equation of the family of circles in the first quadrant which touch the coordinate axes.

A.

B.

C.

D.

Watch Video Solution

11. Solve the differential equation $\frac{dy}{dx} + \sqrt{\frac{1-y^2}{1-x^2}} = 0$

A.

B.

C.

D.

Watch Video Solution

12. Show that the general solution of the differentia equation $\frac{dy}{dx} + \frac{y^2 y + 1}{x^2 + x + 1} = 0$ is given by $x + y + 1 = A(1 - x - y - 2xy)$

where A is a parameter.

A.

B.

C.

D.

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13. Find the equation of the curve passing through the point $\left(0, \frac{\pi}{4}\right)$ whose differential equation is $s \in x \cos y \, dx + \cos x \, s \in y \, dy = 0$.

A.

B.

C.

D.

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14. Find the particular solution of the differential equation $\left(1+e^{2x}\right)dy+\left(1+y^2\right)e^x dx=0,$ given that $y=1$ when $x=0.$

A.

B.

C.

D.

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15. Solve the differential equation :

$ye^{x/y}dx=\left(xe^{x/y}+y^2\right)dy(y\neq 0).$

A.

B.

C.

D.

Watch Video Solution

16. Solve $(x-y)(dx+dy)=dx-dy$, given that $y=-1$, where $x=0$

.

A.

B.

C.

D.

Watch Video Solution

17. Solve $\left[\frac{e^{-2\sqrt{x}}}{\sqrt{x}} - \frac{y}{\sqrt{x}}\right]\frac{dx}{dy} = 1(x \neq 0$

A.

B.

C.

D.

Watch Video Solution

18. Find the particular solution of the differential equation. $\frac{dy}{dx} + y\cot x = 4x \ \cos ec\, x, \ (x \neq 0),$ given that $y = 0$ when $x = \frac{\pi}{2}$.

A.

B.

C.

D.

Watch Video Solution

19. Find a particular solution of the differential equation $(x+1)\frac{dy}{dx} = 2e^{-y} - 1$given that $y = 0$when$x = 0$.

A.

B.

C.

D.

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20. The population of a village increases continuously at the rate proportional to the number of its inhabitants present at any time. If the

population of the village was 20,000 in 1999 and 25000 in the year 2004, what will be the population of the village in 2009?

A.

B.

C.

D.

Answer: Hence, the population was 31,250 in 2009.

Watch Video Solution

21. The general solution of the differential equation $\frac{ydx - xdy}{y} = 0$ is :

A. $xy = C$

B. $x = Cy^2$

C. $y = Cx$

D. $y = Cx^2$.

Answer: C

Watch Video Solution

22. The general solution of a differential equation of the type $\frac{dx}{dy}+P_1x=Q_1$ is (A) $ye^{\int P_1dy}=\int\left(Q_1e^{\int P_1dy}\right)dy+C$ (B) $y\dot{e}^{\int P_1dx}=\int\left(Q_1e^{\int P_1dx}\right)dx+C$ (C) $xe^{\int P_1dy}=\int\left(Q_1e^{\int P_1dy}\right)dy+C$ (D) `x e^(intP_1dx)

A. $ye^{\int P_1dy}=\int\left(Q_1e^{\int P_1dy}\right)dy+C$

B. $y.\ e^{\int P_1dx}=\int\left(Q_1e^{\int P_1dx}\right)dx+C$

C. $xe^{\int P_1dy}=\int\left(Q_1e^{\int P_1dy}\right)dy+C$

D. $xe^{\int P_1dx}=\int\left(Q_1e^{\int P_1dx}\right)dx+C$

Answer: C

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23. The general solution of the differential equation $ex\ dy + (y\ ex + 2x)\ dx = 0$ is (A) $xey + x^2 = C$ (B) $xey + y^2 = C$ (C) $yex + x^2 = C$ (D) $yey + x^2 = C$

A. $xe^y + x^2 = C$

B. $xe^y + y^2 = C$

C. $ye^x + x^2 = C$

D. $ye^y + x^2 = C$

Answer: C

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Exercise

1. If $y + \frac{d}{dx}(xy) = x(\sin x + \log x)$, $f \in dy(x)\cdot$

A.

B.

C.

D.

Answer: $y = -\cos x + \frac{2\sin x}{x} + \frac{2\cos x}{x^2} + \frac{x\log x}{3} - \frac{x}{9} + cx^{-2}$.

Watch Video Solution

2. $(x+y)(dx-dy) = dx+dy$

A.

B.

C.

D.

Answer: $x + y = ce^{x-y}$.

Watch Video Solution

3. Solve $x\,dy - y\,dx = \sqrt{x^2 + y^2}dx$

A.

B.

C.

D.

Answer: $y + \sqrt{x^2 + y^2} = cx^2$.

Watch Video Solution

4. If $x(t)$ is a solution of $\frac{(1+t)dy}{dx} - ty = 1$ and $y(0) = -1$ then $y(1)$ is (a) $(b)(c) - (d)\frac{1}{e}2(f)(g)(h)$ (i) (b) $(j)(k)e + (l)\frac{1}{m}2(n)(o)(p)$ (q) (c) $(d)(e)e - (f)\frac{1}{g}2(h)(i)(j)$ (k) (d) $(l)(m)(n)\frac{1}{o}2(p)(q)(r)$ (s)

A.

B.

C.

D.

Watch Video Solution

Revision Exercise

1. Write order and degree (if defined) of each of the following differential equations.

$$\frac{d^2y}{dx} + 5x\left(\frac{dy}{dx}\right)^2 - 6y = \log x$$

A.

B.

C.

D.

Answer: Order 2, degree 1

Watch Video Solution

2. For each of the differential equations given below, indicate its order and degree (if defined).(i) $\frac{d^2y}{dx^2}+5x\left(\frac{dy}{dx}\right)^2-6xy=\log x$ (ii) $\left(\frac{dy}{dx}\right)^3-4\left(\frac{dy}{dx}\right)^2+7y=\sin x$(iii) $\frac{d^4y}{dx^4}-\sin\left(\frac{d^3y}{dx^3}\right)=0$

A.

B.

C.

D.

Answer: Order 1, degree 3

Watch Video Solution

3. Find the order and degree (if defined) of the equation: $\frac{d^4y}{dx^4}-\sin\left(\frac{d^3y}{dx^3}\right)=0$

A.

B.

C.

D.

Answer: Order 4, degree not defined .

Watch Video Solution

4. For each of the exercises given below, verify that the given function (implicit or explicit) is a solution of the corresponding differential equation.(i) $y = ae^{x} + be^{-x} + x^{2} : x\frac{d^{2}y}{dx^{2}} + 2y\frac{dy}{dx} - xy + x^{2} - 2 = 0$

(ii) `y=e^x(acosx+bsin

A.

B.

C.

D.

Watch Video Solution

5. The differential equation for $y = e^x(a\cos x + b\sin x)$ is

A.

B.

C.

D.

Watch Video Solution

6. For each of the problems, given below, verify that the given function (implicit or explicit) is a solution of the corresponding differential equation :

$y = x\sin 3x \quad : \quad \frac{d^2y}{dx^2} + 9y - 6\cos 3x = 0$

A.

B.

C.

D.

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7. Verify that $x^2 = 2y^2 \log y$ is a solution of the differential equation $\left(x^2 + y^2\right)\frac{dy}{dx} - xy = 0.$

A.

B.

C.

D.

Watch Video Solution

8. Obtain the differential equation of the family of circles passing through the fixed points $(a, 0)$ and $(a, 0)$

A.

B.

C.

D.

Watch Video Solution

9. Prove that $x^2 - y^2 = c(x^2 + y^2)^2$ is the general solution of differential equation $(x^3 - 2xy^2)dx = (y^3 - 3x^2y)dy$, where c is a parameter.

A.

B.

C.

D.

Watch Video Solution

10. Find the general solution of each of the following differential equations:

$$\operatorname{cosec} x \log y \frac{dy}{dx} + x^2 y = 0$$

A.

B.

C.

D.

Answer: $\frac{1}{2}(\log y)^2 = x^2 \cos x - 2x \sin x - 2 \cos x + c.$

Watch Video Solution

11. Solve : $\frac{dy}{dx} = \frac{xe^x \log x + e^x}{x \cos y}$.

A.

B.

C.

D.

Answer: $\sin y = e^x \log x + c$.

Watch Video Solution

12. Solve : $(1 + x^2 + y^2 + x^2y^2)dx + xydy = 0$, given that $y = 0$ when $x = 1$.

A.

B.

C.

D.

Watch Video Solution

13. Solve $x\left(\frac{dy}{dx}\right) = y(\log y - \log x + 1)$

A.

B.

C.

D.

Answer: $\log\left(\frac{y}{x}\right) = cx$

Watch Video Solution

14. The slope of the tangent at a point $P(x, y)$ on a curve is $\left(-\frac{y+3}{x+2}\right)$. If the curve passes through the origin, find the equation of the curve.

A.

B.

C.

D.

Answer: $xy + 3x + 2y = 0$

Watch Video Solution

15. Find the equation of the curve passing through the point $\left(0, \frac{\pi}{4}\right)$ whose differential equation is

$s \in x \cos y \, dx + \cos x \, s \in y \, dy = 0$.

A.

B.

C.

D.

Answer: $\cos x \cos y = \frac{1}{\sqrt{2}}$

Watch Video Solution

16. Find the equation of a curve passing through the point $(1, 1)$, given that the segment of any tangent drawn to the curve between the point of tangency and the y-axis is bisected at the x-axis.

A.

B.

C.

D.

Answer: $y = x^2$

Watch Video Solution

17. The decay rate of radium at any time t is proportional to its mass at that time. Find the time when the mass will be halved of its initial mass.

A.

B.

C.

D.

Watch Video Solution

18. Solve : $\dfrac{dy}{dx} = (2x + 3y - 4)^2$.

A.

B.

C.

D.

Answer: $\frac{1}{\sqrt{6}}\tan^{-1}\left(\sqrt{\frac{3}{2}}(2x+3y-4)\right)=x+c.$

Watch Video Solution

19. Solve: $\frac{dy}{dx}+y=e^{x}$

A.

B.

C.

D.

Answer: $ye^{x}=x+c$

Watch Video Solution

20. Solve the following differential equation: $\left(x^{2}-1\right)\frac{dy}{dx}+2(x+2)y=2\left(x+1\right)$

A.

B.

C.

D.

Answer: $\frac{y(x-1)^3}{x+1} = x^3 - 6x + 8\log|x+1| + c.$

Watch Video Solution

21. Solve: $\frac{dy}{dx} = \frac{y(x+2y)}{x(2x+y)}$,y(1) = 2

A.

B.

C.

D.

Answer: $xy = 2|y-x|^{3/2}$

Watch Video Solution

22. Solve each of the following initial value problem: $\left(y^4 - 2x^3 y\right)dx + \left(x^4 - 2xy^3\right)dy = 0,\ y(1) = 1$

A.

B.

C.

D.

Answer: $\left(x^3 + y^3\right)^2 = 4x^3 y^2$

Watch Video Solution

23. Solve each of the following initial value problem: $x\left(x^2 + 3y^2\right)dx + y\left(y^2 + 3x^2\right)dy = 0,\ y(1) = 1$

A.

B.

C.

D.

Answer: $x^4 + 6x^2y^2 + y^4 = 8$

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24. Solve each of the following initial value problems:

$$\frac{dy}{dx} + \frac{2x}{x^2+1}y = \frac{1}{(x^2+1)^2}, y(0) = 0 \quad \text{(ii)}$$

$$(x^2+1)y - 2xy = (x^4 + 2x^2 + 1)\cos x, y(0) = 0$$

A.

B.

C.

D.

Answer: $y = (x^2+1)\sin x$

Watch Video Solution

25. If $ye^y dx = (y^3 + 2xe^y)dy, y(0) = 1$, then the value of x when y = 0 is

A.

B.

C.

D.

Answer: $\frac{x}{y^2} = e^{-1} - e^{-x}$

Watch Video Solution

26. Find the particular solution of the differential equation $(1 + e^{2x})dy + (1 + y^2)e^x dx = 0$, given that $y = 1$ when $x = 0$.

A.

B.

C.

D.

Answer: $\tan^{-1} y + \tan^{-1} e^x = \frac{\pi}{2}$

Watch Video Solution

27. Find the particular solution of the differential equation. $\frac{dy}{dx} + y \cot x = 4x \ \cos ec\, x, \ (x \neq 0)$, given that $y = 0$ when $x = \frac{\pi}{2}$.

A.

B.

C.

D.

Answer: $y \sin x = 2x^2 - \frac{1}{2}\pi^2 (\sin x \neq 0)$

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28. Find the particular solutions of :

$(1 + xy)ydx + (1 - xy)xdy = 0, y(1) = 1.$

A.

B.

C.

D.

Answer: $x^2 = y^2 . e^{\frac{2}{xy}} - 2(xy \neq 0)$

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29. The rate of increase in the number of bacteria in a certain bacteria culture is proportional to the number present. Given the number triples in 5 hrs., find how many bacteria will be present after 10 hours. Also find the time necessary for the number of bacteria to be 10 times the number of initial present. [Given $(\log)_e 3 = 1.0986, \ e^{2.1972} = 9$]

A.

B.

C.

D.

Answer: 9 times, $5\frac{\log 10}{\log 3}$ **hours.**

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30. The population of a city increases at a rate proportional to the number of its inhabitants present at any time t. If the population of the city was 2,00,000 in 1990 and 2,50,000 in 2000, what was the population of the city in 2010 ?

A.

B.

C.

D.

Answer: 3,12,500

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31. Assume that the rate at which radioactive nuclei decay is proportioanl to the number of such nuclei that are present in a given sample. In a certain sample 10% of the original number of radioactive nuclei have undergone disintegration in a period of 100 years. What percentage of the original radioactive nuclei will remain after 1000 years.?

A.

B.

C.

D.

Answer: (a) $\frac{9^{10}}{10^8}\%$ $\quad (b) 133\frac{1}{3}$ **gms.**

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32. If the interest is compounded continuously at 6% per annum, how much worth Rs. 1000 will be after 10 years? How long will it take to double Rs. 1000? [Given $e^{0.6} = 1.822$]

A.

B.

C.

D.

Answer: Rs. 1822, 12 year (app.)

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33. A thermometer reading $80^0 F$ is taken outside. Five minutes later the thermometer reads $60^0 F$. After another 5 minutes the thermometer reads $50^0 F$. What is the temperature outside?

A.

B.

C.

D.

Answer: $40^\circ F$.

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CHECK YOUR UNDERSTANDING

1. What is the degree of $x\left(\frac{d^2y}{dx^2}\right)^3+y\left(\frac{dy}{dx}\right)^4+x^3=0$?

A.

B.

C.

D.

Answer: 3

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2. What is the order of $(y'')^2 + \cos y' = 0$?

A.

B.

C.

D.

Answer: 2

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3. निम्नलिखित अवकल समीकरणों की कोटि एवं घात ज्ञात कीजिए :

$$x\frac{dy}{dx} + \frac{3}{\frac{dy}{dx}} = y^2$$

A.

B.

C.

D.

Answer: No

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4. Verify that $y = A\cos x - B\sin x$ is a solution of the differential equation $\frac{d^2y}{dx^2} + y = 0$

A.

B.

C.

D.

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5. Solve the following differential equation: $\frac{dy}{dx} = \log x$

A.

B.

C.

D.

Answer: $y = x(\log x - 1) + c$

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6. Solve $\frac{dr}{d\theta} = \cos\theta.$

A.

B.

C.

D.

Answer: $r = \sin\theta + c(\theta \in R)$

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7. Solve the following differential equations: $\frac{dy}{dx} - \frac{y-x}{y+x}$

A.

B.

C.

D.

Answer: Yes

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8. Is the function $f(x, y) = \sin x + \cos y$ homogeneous ?

A.

B.

C.

D.

Answer: No

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9. $(x \log x)\frac{dy}{dx} + y = 2 \log x$

A.

B.

C.

D.

Answer: $\log x$

Watch Video Solution

10. Solve $\left[\frac{e^{-2\sqrt{x}}}{\sqrt{x}} - \frac{y}{\sqrt{x}}\right]\frac{dx}{dy} = 1(x \neq 0$

A.

B.

C.

D.

Answer: $e^{2\sqrt{x}}$

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COMPETITION FILE

1. The differential equation of the family of circles with fixed radius 5 units and centre on the line y=2 is

A. $(x-2)^2 y'^2 = 25 - (y-2)^2$

B. $(x-2)y'^2 = 25-(y-2)^2$

C. $(y-2)y'^2 = 25-(y-2)^2$

D. $(y-2)^2 y'^2 = 25-(y-2)^2$.

Answer: D

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2. Solution of the differential equation

$$\frac{dy}{dx} = \frac{x+y}{x},$$

satisfying the condition $y(1)=1$, is

A. $y = x\ln x + x$

B. $y = \ln x + x$

C. $y = x\ln x + x^2$

D. $y = xe^{(x-1)}$.

Answer: A

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3. The differential equaiotn which represents the family of curves $y = C_1 e^{C_2 x}$, where C_1 and C_2 are arbitrary constants, is

A. $y'' = y'y$

B. $yy'' = y'$

C. $yy'' = (y)^2$

D. $y' = y^2$.

Answer: C

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4. The solution of differential equation

$\cos x dy = y(\sin x - y)dx, 0 < x < \pi/2$ is

A. $\sec x = (\tan x + c)y$

B. $y \sec x = \tan x + c$

C. $y \tan x = \sec x + c$

D. $\tan x = (\sec x + c)y$.

Answer: A

Watch Video Solution

5. If $\frac{dy}{dx} = y + 3$ and $y(0) = 2$, then y(ln 2) is equal to

A. 4

B. 5

C. 13

D. -2

Answer: A

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6. Let I be the purchase value of an equipment and V(t) be the value after it has been used for t years. The value V(t) depreciates at a rate given by differential equation $\left(dV\frac{t}{dt} = -k(T-t)\right.$, where $k > 0$ is a constant and T is the total life in years of the equipment. Then the scrap value V(T) of the equipment is : (1) $T^2 - \frac{1}{k}$ (2) $I - \frac{kT^2}{2}$ (3) $I - \frac{k(T-t)^2}{2}$ (4) e^{-kT}

A. $T^2 - \frac{1}{k}$

B. $I - \frac{kT^2}{2}$

C. $I - \frac{k(T-t)^2}{2}$

D. e^{-kt}

Answer: B

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7. Consider the differential equation $y^2dx + \left(x - \frac{1}{y}\right)dy = 0$ if $y(1) = 1$ then x is

A. $4-\frac{2}{y}-\frac{e^{1/y}}{e}$

B. $3-\frac{1}{y}+\frac{e^{1/y}}{e}$

C. $1+\frac{1}{y}-\frac{e^{1/y}}{e}$

D. $1-\frac{1}{y}+\frac{e^{1/y}}{e}$

Answer: C

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8. The curve that passes through the point $(2, 3)$ and has the property that the segment of any tangent to it lying between the coordinate axes is bisected by the point of contact, is given by

A. $2y-3x=0$

B. $y=\frac{6}{x}$

C. $x^2+y^2=13$

D. $\left(\frac{x}{2}\right)^2+\left(\frac{y}{3}\right)^2=2.$

Answer: B

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9. The population $p(t)$ at a time t of a certain mouse species satisfies the differential equation $\frac{dp(t)}{dt} = 0.5p(t) - 450.$ If $p(0) = 850.$ Then the time at which the population becomes zero is

A. $2 \ln 18$

B. $\ln 9$

C. $\frac{1}{2} \ln 18$

D. $\ln 18$

Answer: A

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10. At present, a firm is manufacturing 2000 items. It is estimated that the rate of change of production P w.r.t. additional number of workers x is given by $\frac{dP}{dx} = 100 - 12\sqrt{x}.$ If the firm employs 25 more workers, then the new level of production of items is (1) 3000 (2) 3500 (3) 4500 (4) 2500

A. 3000

B. 3500

C. 4500

D. 2500

Answer: B

Watch Video Solution

11. Let the population of rabbits surviving at a time t be governed by the differential equation $\left(dp\frac{t}{dt} = \frac{1}{2}p(t) - 200.\right.$ If $p(0) = 100$, then p(t) equals (1) $400 - 300e^{t/2}$ (2) $300 - 200e^{-t/2}$ (3) $600 - 500e^{t/2}$ (4) $400 - 300e^{-t/2}$

A. $300 - 200e^{-t/2}$

B. $600 - 500e^{t/2}$

C. $400 - 300e^{-t/2}$

D. $400 - 300e^{t/2}$

Answer: D

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12. The function $y = f(x)$ is the solution of the differential equation $\frac{dy}{dx} + \frac{xy}{x^2 - 1} = \frac{x^4 + 2x}{\sqrt{1 - x^2}}$ in $(-1, 1)$ satisfying $f(0) = 0$. Then $\int_{\frac{\sqrt{3}}{2}}^{\frac{\sqrt{3}}{2}} f(x)dx$ is (a) $(b)(c)(d)\frac{\pi}{e}3(f)(g) - (h)\frac{(i)\sqrt{(j)3(k)}(l)}{m}2(n)(o)(p)$ (q) (b) $(r)(s)(t)\frac{\pi}{u}3(v)(w) - (x)\frac{(y)\sqrt{(z)3(aa)}(bb)}{cc}4(dd)(ee)(ff)$ (gg) (c) $(d)(e)(f)\frac{\pi}{g}6(h)(i) - (j)\frac{(k)\sqrt{(l)3(m)}(n)}{o}4(p)(q)(r)$ (s) (d) $(t)(u)(v)\frac{\pi}{w}6(x)(y) - (z)\frac{(aa)\sqrt{(bb)3(cc)}(dd)}{ee}2(ff)(gg)(hh)$ (ii)

A. $\frac{\pi}{3} - \frac{\sqrt{3}}{2}$

B. $\frac{\pi}{3} - \frac{\sqrt{3}}{4}$

C. $\frac{\pi}{4} - \frac{\sqrt{3}}{4}$

D. $\frac{\pi}{6} - \frac{\sqrt{3}}{2}$

Answer: B

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13. Let y(x) be the solution of the differential equation . $(x \log x)\frac{dy}{dx} + y = 2x \log x, (x \geq 1)$. Then y (e) is equal to

A. e

B. 0

C. 2

D. 2e

Answer: C

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14. If the curve $y = f(x)$ passes through the point (1, -1) and satisfies the differential equation :

$y(1 + xy)dx = xdy$, then $f\left(-\frac{1}{2}\right)$ is equal to :

A. $-\frac{4}{5}$

B. $\frac{2}{5}$

C. $\frac{4}{5}$

D. $-\frac{2}{5}$

Answer: C

Watch Video Solution

15. If $(2 + \sin x)\frac{dy}{dx} + (y + 1)\cos x = 0$ and $y(0) = 1$, then $y\left(\frac{\pi}{2}\right)$ is equal to :

A. $-\frac{1}{3}$

B. $\frac{4}{3}$

C. $\frac{1}{3}$

D. $-\frac{2}{3}$

Answer: C

Watch Video Solution

16. Let $y = g(x)$ be the solution of the differential equation $\frac{\sin(dy)}{dx} + y\cos x = 4x, x \in (0, \pi)$ If y(pi/2)=0, $then$y(pi/6)` is equal to

A. $\frac{4}{9\sqrt{3}}\pi^2$

B. $-\frac{8}{9\sqrt{3}}\pi^3$

C. $-\frac{8}{9}\pi^2$

D. $-\frac{4}{9}\pi^2$

Answer: B

Watch Video Solution

17. let $y(x)$ satisfying the differential equation $x\frac{dy}{dx}+2y=x^2$ given $y(1)=1$ then $y(x)=$

A. $\frac{x^2}{4}-\frac{3}{4x^2}$

B. $\frac{x^3}{4}+\frac{3}{4x^2}$

C. $\frac{x^2}{4}+\frac{3}{4x}$

D. $\frac{x^2}{4}+\frac{3}{4x^2}$

Answer: D

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CHAPTER TEST (9)

1. A homogeneous differential equation of the from $\frac{dx}{dy}=h\left(\frac{x}{y}\right)$ can be solved by making the substitution.(A) $y=vx$ (B) $v=yx$ (C) $x=vy$ (D) $x=v$

A. $y = vx$

B. $v = yx$

C. $x = vy$

D. $x = v$

Answer: C

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2. The degree and order of the differential equation :

$$2\frac{d^2y}{dx} - 3\frac{dy}{dx} + y = 0:$$

A. (2, 1)

B. (1, 2)

C. (2, 2)

D. Not defined

Answer: B

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3. The order and degree , if defined, of the differential equation :

$y''' + y^2 + e^x = 0$ is ______ and ______ .

A.

B.

C.

D.

Answer: 3; 1

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4. Find the general solution of $\frac{dy}{dx} = \sqrt{4 - y^2}(-2 < y < 2)$.

A.

B.

C.

D.

Answer: $y = 2\sin(x + c)$

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5. $x\dfrac{dy}{dx} - y = x + 1$

A.

B.

C.

D.

Answer: $\dfrac{1}{x}$

Watch Video Solution

6. Form the differential equation of the family of circles touching the y-axis at origin.

A.

B.

C.

D.

Answer: $2xyy' + x^2 - y^2 = 0$

Watch Video Solution

7. $\sqrt{1 + x^2 + y^2 + x^2y^2} + xy\frac{dy}{dx} = 0$

A.

B.

C.

D.

Answer: $\sqrt{1+x^2}+\frac{1}{2}\log\left|\frac{\sqrt{1+x^2}-1}{\sqrt{1+x^2}+1}\right|+\sqrt{1+y^2}=c.$

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8. हल कीजिए : $xy\log\left(\frac{x}{y}\right)dx+\left\{y^2-x^2\log\left(\frac{x}{y}\right)\right\}dy=0.$

A.

B.

C.

D.

Answer: $\log|y|+\frac{x^2}{2y^2}(\log.\frac{y}{x}+\frac{1}{2})=c.$

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9. Solve the differential equation $(\tan^{-1}y - x)dy = (1 + y^2)dx$.

A.

B.

C.

D.

Answer: $x = (\tan^{-1}y - 1) + ce^{-\tan^{-1}y}$.

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10. Solve the following differential equation: $\frac{dy}{dx} + y\cot x = 4x \cos ec\, x$, given that $y = 0$ when $x = \frac{\pi}{2}$

A.

B.

C.

D.

Answer: $y \sin x = 2x^2 - \frac{\pi^2}{2}$.

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11. Find the equation of the curve passing through the point $\left(0, \frac{\pi}{4}\right)$ whose differential equation is

$s \in x \cos y \, dx + \cos x \, s \in y \, dy = 0$.

A.

B.

C.

D.

Answer: $\cos x \cos y = \frac{1}{\sqrt{2}}$.

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12. Show that the general solution of the differentia equation $\frac{dy}{dx}+\frac{y^2y+1}{x^2+x+1}=0$ is given by $x+y+1=A(1-x-y-2xy)$ where A is a parameter.

A.

B.

C.

D.

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