MATHS

BOOKS - FULL MARKS MATHS (TAMIL ENGLISH)

ORDINARY DIFFERENTIAL EQUATIONS

Example Question Solved

1. If $y = \frac{1}{4}u^4$ and $u = \frac{2}{3}x^3 + 5$, then $\frac{dy}{dx}$ is

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

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3. Form the differential aequation by eliminating the arbitrary constant a and B from y =A cos x+ B sin x

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4. Find the differential equation of the family of circles passing through the points (a,0) and (-a,0)

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5. Find the differential equation of the family of parabolas $y^2 = 4$ ax where a is an arbitrary constant .

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6. Find the differential equations of the family of all the ellipses having foci on the y-axis and centre at the origin.

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7. The general solution of the differential equation $\frac{dy}{dx} = \frac{y}{x}$ is

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8. Show that $y = mx + \frac{7}{m}, m \neq 0$ is a solution of the differential equation $xy' + 7\frac{1}{y'} - y = 0$

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9. Show that y =a cos (log x)+b sin (logx),$x \leq 0$ is a soluton of the differential equation $x^2y'' + xy' + y = 0$

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

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11. Find tha particular solution of $(1+x^2)dy - x^2ydx = 0$ satisfying the condition y(1) =2

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12. Solve $y' = \sin^2(x-y+1)$

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13. Solve $\frac{dy}{dx} = \sqrt{4x + 2y - 1}$

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14. Solve $\frac{dy}{dx} = \frac{x - y + 5}{2(x - y) + 7}$

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15. Solve $\frac{dy}{dx} = (3x + y + 4)^2$

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16. Solve $\left(x^2 - 3y^2\right)dx + 2xydy = 0$

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17. Solve $\left(y + \sqrt{x^2 + y^2}\right)dx - xdy = 0$

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18. Solve $(2x + 3y)dx + (y - x)dy = 0$

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

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20. Solve $\left(1 + 2e^{x/y}\right) dx + 2e^{x/y}\left(1 - \frac{x}{y}\right) dy = 0$

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

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22. Solve $\left[y(1-x\tan x)+x^2\cos x\right]dx-xdy=0$

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23. Solve : $\frac{dy}{dx}+2y\cot x=3x^2\text{cosec}^2x.$

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24. Solve $\left(1+x^3\right)\frac{dy}{dx}+6x^2y=1+x^2$

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25. Solve $ye^y dx = \left(y^3 + 2xe^y\right) dy$

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26. The growth of a population is proportional to the number present if the population of a colony doubles in 50 years in how many years will the population become triple

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27. A radioactive isotope has an ntitial mass 200 mg which two years later is 50 mg find the expression for the amount of the isotope remaining at any time what is its half life

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28. In a murder investigation a corpse found by a detective at exactly 8 pm being alert the detective measued the body temperature again and found it to be 60° f if the the room temperature is 50° F and assuming that the body temperature of the person before deathe was 98.6° f at what time did

the murder occure ? log 2.43 =0.88789 log (0.5) =-0.69315

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29. A tank contains 1000 liters of water in which 100 grams of salts is dissolved brine runs in a rate of 10 liter per minute and each litre contains 5 grams of dissolved salt the mixture of the tank is kept uniform by stirring brine runs out at 10 liter per minute find the amount of salt at any time t

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Exercise 10 1

1. For each the following differential equaltions determine ists order degree (if exists)

$(i)\dfrac{dy}{dx}+xy=\cot x$

(ii) $\dfrac{d^3y}{\left(dx^3\right)^{\frac{2}{3}}}-3\dfrac{d^2y}{dx^2}+5\dfrac{dy}{dx}+4=0$

(iii) $\dfrac{d^2y}{\left(dx^2\right)^2}+\dfrac{dy}{(dx)^2}=x\dfrac{\sin\left(d^2y\right)}{dx^2}$

(iv) $\dfrac{\sqrt{dy}}{dx}-4\dfrac{dy}{dx}-7x=0$

(v) $y\dfrac{dy}{dx}=\dfrac{x}{\left(\frac{dy}{dx}+\frac{dy}{dx}\right)^3}$

(vi) $x^2\dfrac{d^2y}{dx^2}+\left[1+\dfrac{dy}{(dx)^2}\right]^{\frac{1}{2}}=0$

(vii) $\frac{d^2y}{\left(dx^2\right)^3} = \sqrt{1 + \frac{dy}{dx}}$

(viii) $\frac{d^2y}{dx^2} = xy + \frac{\cos(dy)}{dx}$

$(ix)\frac{d^2y}{dx^2} + 5\frac{dy}{dx} + \int ydx = x^3\ x = e^{xy}\frac{dy}{dx}$

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Exercise 10 2

1. Express each of the following physical statements in the form of differential equation

(i) radium decays at a rate proportional to the amount Q present

(ii) The population P of a city increases at a rate

proportional to the product of population and to the difference between 500000 and the population

(iii) For a certain substance the rate of change of vapor pressure p with respect to temperature T is proportional to the vapor pressure and inversely proportional to the square of the temperature

A saving amount pays 8% interest per year compounded continously in addition the income from another investment is credited to the amount continously at the rate of Rs 400 per year

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2. Assume that a spherical rain drop evaporates at a rate proportional to its surface area. Form a differential equation involving the rate of change of the radius of the rain drop.

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Exercise 10 3

1. Find the differential equation of the family of

(i) all non vertical lines in a plane

(ii) all non horizontal lines in a plane

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2. Form the differential equation of all straight lines touching the circle $x^2 + y^2 = r^2$.

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3. Find the differential equation of the family of circles passing through the origin and having their centres on the x - axis.

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4. Find the differential equation of the family of all the parabolas with latus rectum 4a and whose axes are parallel to the x-axis.

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5. Find the differential equation of the family of parabolas with vertex at $(0, -1)$ and having axis along the y-axis.

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6. Find the differential equations of the family of all the ellipses having foci on the y-axis and centre at the origin.

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7. Find the differential equation corresponding to the family of curves represented by the equation $y = Ae^{8x} + Be^{-8x}$, where A and B are arbitrary constants.

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8. Find the differential equation of the curve represented by $xy = ae^{x} + be^{-x} + x^{2}$.

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Exercise 10 4

1. Show that each of the following expressions is a soluton of the corresponding given differential equation

(i) $y = 2x^{2}, xy' = 2y$

(ii) $y = ae^{x} + be^{-x}, y'' - y = 0$

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2. Find value of m so that the function $y = e^{mx}$ is a solution of the given differential equation.

$y'' - 5y' + 6y = 0$

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3. The slope of the tangent to the curve at any point is the reciprocal of four times the ordinate at that point. The curve passes through (2, 5). Find the equation of the curve.

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4. Show that $y = e^{-x} + mx + n$ is a solution of the differential equation $e^x \frac{d^2y}{dx^2} - 1 = 0.$

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5. Show that $y = ax + \frac{b}{x}, x \neq 0$ is a solution of the differential equation $x^2y'' + xy' - y = 0.$

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6. Show what $y = ae^{-3x} + b,$ where a and b are arbitary constants, is a solution of the differential

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

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7. Show that the differential equation representing the family of curves $y^2 = 2a\left(x + a^{\frac{2}{3}}\right)$ where a is positive parameter, s $\left(y^2 - 2xy\frac{dy}{dx}\right)^3 = 8\left(y\frac{dy}{dx}\right)^5$

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8. Show that $y = a\cos bx$ is a solution of the differential equation $\frac{d^2y}{dx^2} + b^2y = 0.$

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Exercise 10 5

1. If F is the constant force generated by the motor of an automobiles of mass M, its velocity V is given by $M\frac{dV}{dt} = F - kV$, where k is a constant. Express V in terms of t given that V = 0 when t = 0.

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2. The velocity v, of a parachute falling vertically satisfies the equation $v\frac{dv}{dx} = g\left(1 - \frac{v^2}{k^2}\right)$, where g and k are constants. If v and x are both initially zero, find v in terms of x.

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3. Find the equation of the curve whose slope is $\frac{y-1}{x^2+x}$ and which passes through the point (1,0).

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4. Solve the differential equations :

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

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Exercise 10 6

1. Solve the differential equations :

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

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2. Solve the differential equations :

$$\left(x^3+y^3\right)dy-x^2ydx=0$$

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3. Solve the differential equations :

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

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4. Solve the differential equations :

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

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5. Solve the differential equations :

$$(y^2 - 2xy)\,dx = (x^2 - 2xy)\,dy$$

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6. Solve the following differential equations :

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

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7. $\left(1+3e^{\frac{y}{x}}\right)dy+3x^{\frac{y}{x}}\left(1-\frac{y}{x}\right)dx=0$, given that $y=0$ and $x=1$

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8. $\left(x^2+y^2\right)dy=xydx$. It is given that $y(1)=1$ and $y(x_0)=e$. Find the vale of x_0.

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Exercise 10 7

1. Solve the following Linear differential equations :

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

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

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3. Solve the following linear differential equation

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

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4. $\left(x^2+1\right)\frac{dy}{dx}+2xy=\sqrt{x^2+4}$

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5. $\left(2x-10y^3\right)dy+ydx=0$

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

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7. $\left(y - e^{\sin^{-1} x}\right)\frac{dy}{dx} + \sqrt{1 - x^2} = 0.$

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8. Solve the following linear differential equation

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

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

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10. Solve the following linear differential equation

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

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

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12. $\frac{dy}{dx} = \frac{\sin^2 x}{1 + x^3} - \frac{3x^2}{1 + x^3} y$

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13. Solve the following linear differential equation

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

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14. $x\frac{dy}{dx} + 2y - x^2\log x = 0$

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15. $\frac{dy}{dx} + \frac{3y}{x} = \frac{1}{x^2}$, given that y = 2 when x = 1.

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Exercise 10 8

1. The rate of increase in the number of bacteria in a certain bacteria culture is proportional to the number present. Given that the number triples in 5 hours, find how many bacteria will be present after 10 hours ?

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2. Find the population of a city at any time t, given that the rate of increase of population is proportional to the population at that instant and

that in a period of 40 years the population increased from 3,00,000 to 4,00,000.

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3. The equation of electromotive force for an electric circuit containing resistance and self inductance is $E = Ri + L\frac{di}{dt}$, where E is the electromotive force is given to the circuit, R the resistance and L, the coefficient of induction. Find the current i at time t when E = 0.

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4. The engine of a motor boat moving at 10 m/s is shut off. Given that the restardation at any subsequent time (aftere shutting off the engine) equal to the velocity at that time. Find the velocity after 2 seconds of switching off the engine.

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5. Suppose a person deposits 10,000 Indian rupees in a bank account at the rate of 5% per annum compounded continuously. How much money will be in his bank account 18 months later?

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6. 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.?

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7. Water at temperature $100^\circ C$ cools in 10 minutes to $80^\circ C$ in a room temperature of $25^\circ C$.

Find

(i) The temperature of water after 20 minutes

(ii) The time when the temperature is $40^\circ C$

$$\left[\log_e \frac{11}{15} = -0.3101, \log_e 5 = 1.6094\right]$$

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8. At 10.00 A.M. a woman took a cup of hot instant coffe from her microwave oven and placed it on a nearby Kitchen counter to cool. At this instant the temperature of the coffee was $180^\circ F$, and 10 minutes later it was $160^\circ F$. Assume that constant temperature of the kitchen was $70^\circ F$.

(i) What was the temperature of the coffee at 10.15 A.M. ?

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9. A pot of boiling water at $100^{\circ} C$ is removed from a stove at time t = 0 and left to cool in the kitchen. After 5 minutes, the water temperature has decreased to $80^{\circ} C$, and another 5 minutes later it has dropped to $65^{\circ} C$. Determine the temperature of the kitchen.

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10. A tank initially contains 50 litres of pure water. Starting at time t = 0 a brine containing with 2 grams of dissolved salt per litre flows into the tank at the rate of 3 litres per minutes. The mixture is kept uniform by stirring and the well - stirred mixture simultaneously flows out of the tank at the same rate. Find the amount of salt present in the tank at any time $t > 0$.

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Exercise 10 9

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

A. 2,3

B. 3,3

C. 2,6

D. 2,4

Answer: A

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

A. $\frac{d^2y}{dx^2} - y = 0$

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

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

D. $\frac{d^2x}{dy^2} = 0$

Answer: B

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3. The order and degree of the different equation $\sqrt{\sin x}(dx + dy) = \sqrt{\cos x}(dx - dy)$ is

A. 1,1

B. 2,2

C. 1,1

D. 2,1

Answer: C

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4. The order of the differential equation of all circles with centre at (h,k) and radius 'a' is .....

A. 2

B. 3

C. 4

D. 1

Answer: A

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5. The differential equation of the family of curves $y = Ae^x + be^{-x}$, where A and B are arbitrary constant is

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

B. $\frac{d^2y}{dx^2} - y = 0$

C. $\frac{dy}{dx} + y = 0$

D. $\frac{dy}{dx} - y = 0$

Answer: B

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6. The general solution of the differential equation $\frac{dy}{dx} = \frac{y}{x}$ is

A. xy=k

B. y=k log x

C. y=kx

D. log y =kx

Answer: C

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7. The solution of the differential equation $2x\frac{dy}{dx} - y = 3$ represents

A. straight lines

B. circles

C. parabola

D. ellipse

Answer: C

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8. The solution of $\frac{dy}{dx} + p(x)y = 0$ is

A. $y = ce^{\int pdx}$

B. $y = ce^{-\int pdx}$

C. $x = ce^{-fpdy}$

D. $x = ce^{\int pdy}$

Answer: B

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9. The integrating factor of the differential equation $\frac{dy}{dx} + P(x)y = Q(x)$ is x, then $P(x)$

A. $\frac{x}{e^{\lambda}}$

B. $\frac{e^{x}}{x}$

C. λe^{x}

D. e^{x}

Answer: B

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10. The integrating factor of the differential equation $\frac{dy}{dx} + P(x)y = Q(x)$ is x, then $P(x)$

A. x

B. $\frac{x^2}{2}$

C. $\frac{1}{x}$

D. $\frac{1}{x^2}$

Answer: C

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11. The degree of the differential equation $y(x) = 1 + \frac{dy}{dx} + \frac{1}{1.2}\left(\frac{dy}{dx}\right)^2 + \frac{1}{1.2.3}\left(\frac{dy}{dx}\right)^3 + \ldots$ is

A. 2

B. 3

C. 1

D. 4

Answer: C

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12. If p and q are the oder and degree of the differential equation $y\frac{dy}{dx} + x^3\left(\frac{d^2y}{dx^2}\right) + xy = \cos x,$ when

A. $p < q$

B. p=q

C. $p > q$

D. p exist and q does exist

Answer: C

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13. The solution of the differential equation $\frac{dy}{dx} + \frac{1}{\sqrt{1-x^2}} = 0$ is

A. $y + \sin^{-1} x = c$

B. $x + \sin^{-1} y = 0$

C. $y^2 + 2\sin^{-1} x = c$

D. $x^2 + 2\sin^{-1} y = 0$

Answer: A

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14. The solution of the differential equation $\frac{dy}{dx} = 2xy$ is

A. $y = ce^{x^2}$

B. $y = 2x^2 + c$

C. $y = ce^{-x^2} + c$

D. $y = x^2 + c$

Answer: A

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15. The general solution of the differential equation $\log\left(\frac{dy}{dx}\right) = x + y$ is

A. $e^x + e^y = c$

B. $e^x + e^{-y} = c$

C. $e^{-x} + e^y = c$

D. $e^{-x} + e^{-y} = c$

Answer: B

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16. The solution of $\frac{dy}{dx} = 2^{y-x}$ is

A. $2^x + 2^y = c$

B. $2^x - 2^y = c$

C. $\frac{1}{2^x} - \frac{1}{2^y} = c$

D. $x + y = c$

Answer: C

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17. The solution of the differential equation $\frac{dy}{dx} = \frac{y}{x} + \frac{\phi\left(\frac{y}{x}\right)}{\phi'\left(\frac{y}{x}\right)}$ is

A. $x\phi\frac{y}{x} = k$

B. $\phi\frac{y}{x} = kx$

C. $y\phi\frac{y}{x} = k$

D. $\phi\frac{y}{x} = ky$

Answer: B

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18. If $\sin x$ is the integrating factor of the linear differential equation $\frac{dy}{dx} + Py = Q,$ then P is

A. log sinx

B. cos x

C. tan x

D. cot x

Answer: D

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19. The number of arbitrary constants in the general solutions of order n and $n+1$ are respectively

A. n-1,n

B. n,n+1

C. n+1,n+2

D. n+1,n

Answer: B

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20. The number of arbitrary constants in the particular solution of a differential equation of third order is

A. 3

B. 2

C. 1

D. 0

Answer: D

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21. Integrating factor of the differential equation is $\frac{dy}{dx} = \frac{x+y+1}{x+1}$ is

A. $\frac{1}{x+1}$

B. $x+1$

C. $\frac{1}{\sqrt{x+1}}$

D. $\sqrt{x+1}$

Answer: A

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22. The population P in any year t is such that the rate of increase in the population is proportional to the population. Then

A. $P = ce^{kt}$

B. $P = ce^{-kt}$

C. $P = ckt$

D. $P = C$

Answer: A

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23. P is the amount of certain substanc left in after time t. If the rate of evaporation of the substance is proportional to the amount remaining, then

A. $P = ce^{kt}$

B. $P = ce^{-kt}$

C. $P = ckt$

D. $Pt = C$

Answer: B

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24. If the solution of the differential equation $\frac{dy}{dx} = \frac{ax+3}{2y+f}$ represents a circle , then the value of a is :

A. 2

B. -2

C. 1

D. -1

Answer: B

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25. The slope at any point of a curve $y = f(x)$ is given by $\frac{dy}{dx} = 3x^2$ and it passes through $(-1, 1)$. Then the equation of the curve is

A. $y = x^3 + 2$

B. $y = 3x^2 + 4$

C. $y = 3x^3 + 4$

D. $y = x^3 + 5$

Answer: A

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Additional Problems

1. Find the order and degree of the following differential equations

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

(ii) $y' + y^2 = x$

(iii) $y' + 3y^2 + y^3 = 0$

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

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

(vi) $y' = (y - y'3)^{2/3}$

(vii) $y' + \left(y^2\right) = \left(x + y^2\right)$

(viiii) $y' + (y)^2 = x(x + y)^2$ (ix)

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

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

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2. Find the differential equation of the family of straight lines y $=mx+\frac{a}{m}$ when (i) m is the parameter (ii) a is the parameter (iii) a , m both are parameters

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3. Find the differential equation that will represented family of all circles having centres on the x axis and the radius is unity

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4. Form the differential equation from $y^2 = 4a(x - a)$

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5. Verify that the function y=a cos x + b sin x is a solution of the differential equation $\cos x \frac{dy}{dx} + y \sin x = b$

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6. Verify that the function y =4 sin 3x is a solution of the differential equation $\frac{d^2y}{dx^2} + 9y = 0$

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7. Verify that function $y = ax^2 + bx + c$ is a solution of the differential equation $\frac{d^2y}{dx^2} = 2a$

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

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

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10. Solve

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

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11. Find the cubic polynomial in x which attains its maximum value 4 and minimum value 0 at x =-1 and 1 respectively

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12. The normal lines to a given curve at each point (x,y) on the curve pass through the point (2,0) the curve passes through the point (2,3) formulate the differential equation representign the problem and hecne find the equation of the curve

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13. Solve $\left(2\sqrt{xy-x}dy+dx=0\right.$

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

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15. Solve $\frac{dy}{dx}=\frac{y(x-2y)}{x(x-3y)}$

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16. Solve $\left(x^2+y^2\right)dy = xydx$

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17. Find the equation of the curve passing through (1,0) and which has slope $1+\frac{y}{x}$ at (x,y)

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

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19. Solve $(1-x)^2)\frac{dy}{dx}+2xy=x\sqrt{1-x^2}$

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

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21. The I.E. of $\left(1+y^2\right)dx=\left(\tan^{-1}y-x\right)dy$ is

_____.

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22. $dx + xdy = e^{-y}\sec^2 ydy$

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23. In a certain chemical reaction the rate of conversion of a susbtance at time t is proportional to the quantity of the substance still undtransformed at that instant at the end of one hour 60 grmas remain and at the end of 4 hour 21 grmas how many grams of the substance was there initially

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24. The temperature T of a cooling object drops at a rate proportional to the difference T-S where S is constant temperature of surrounding medium if initially T= 150° C find the temperature of the cooling object at any time t

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25. The sum of Rs 1000 is compounded continously the nominal rate of interest being four per cent per annum in how many years will the amount be twice the original principal $[\log_e 2 = 0.6931]$

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26. A cup of coffee at temperature $100^\circ C$ is placed in a room whose temperature is $15^\circ C$ and it cools to $60^\circ C$ in 5 minutes. Find its temperature after a further interval of 5 minutes

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27. The rate at which the population of a city increases at any time is propotional to the population at that time. If there were 1,30,000 people in the city in 1960 and 1,60,000 in 1990 what

population may be anticipated in 2020. [loge(16/13)=.2070;e.42=1.52]

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28. The integrating factor of $\frac{dy}{dx} + 2\frac{y}{x} = e^{4x}$ is :

A. log x

B. x^2

C. e^x

D. d

Answer: B

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29. If cos x is an integrating factor of the differntial equation $\frac{dy}{dx} + Py = Q$ then P =.....

A. $-\cot x$

B. cot x

C. tan x

D. $-\tan x$

Answer: D

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30. $dx + xdy = e^{-y}\sec^2 ydy$

A. e^x

B. e^{-x}

C. e^y

D. e^{-y}

Answer: C

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31. The integrating factor of $\frac{dy}{dx} + \frac{1}{x\log x}y = \frac{2}{x^2}$

is :

A. e^x

B. log x

C. $\frac{1}{x}$

D. e^{-x}

Answer: B

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32. Solution of $\frac{dx}{dy} + mx = 0$ where $m < 0$ is

A. $x = ce^{my}$

B. $x = ce^{-my}$

C. $x = my + c$

D. x=c

Answer: B

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33. $y = cx - c^2$ is the general solution of the differential equation.

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

B. $y^n = 0$

C. $y' = c$

D. $(y')^2 + xy' + y = 0$

Answer: A

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34. Find the differential equation of the family of (i) all non- vertical lines in a plane

A. $\frac{dy}{dx} = 0$

B. $d^2y\frac{)}{dx^2} = 0$

C. $\frac{dy}{dx} = m$

D. $\frac{d^2y}{dx^2} = m$

Answer: B

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35. The differential equation of all circles with centre at the origin is .....

A. $x\,dy + y\,dx = 0$

B. $x\,dy - y\,dx = 0$

C. $x\,dx + y\,dy = 0$

D. $x\,dx - y\,dy = 0$

Answer: C

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36. The differential equation of the family of lines $y = mx$ is :

A. $\frac{dy}{dx} = m$

B. $ydx - xdy = 0$

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

D. ydx+xdy=0

Answer: B

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37. The degree of the differntial equation $\sqrt{1+\left(\frac{dy}{dx}\right)^{1/3}}=\frac{d^2y}{dx^2}$

A. 1

B. 2

C. 3

D. 4

Answer: B

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38. The degree of the differential equation $\rho = \frac{\left(1+\left(\frac{dy}{dx}\right)^2\right)^{\frac{3}{2}}}{\frac{d^2y}{dx^2}}$ where ρ is a constant is :

A. 1

B. 3

C. -2

D. 2

Answer: B

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39. The amount present in a radio active element disintegrates a rate proportional to its amount the differntial equation corresponding to the above statement is (k is negative)

A. $\frac{dp}{dt} = \frac{k}{p}$

B. $\frac{dp}{dt} = kt$

C. $\frac{dp}{dt} = kp$

D. $\frac{dp}{dt} = -kt$

Answer: C

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40. On putting y =vx the homogeneous equation $x^2dy + y(x+y)dx = 0$ becomes .....

A. $xdv + \left(2v + v^2\right)dx = 0$

B. $vdx + \left(2x + x^2\right)dv = 0$

C. $v^2dx - \left(x + x^2\right)dx = 0$

D. $vdv + \left(2x + x^2\right)dx = 0$

Answer: A

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