MATHS

BOOKS - NCERT MATHS (ENGLISH)

DIFFERENTIAL EQUATIONS

Objective

1. The degree of the potential equation $\left(\frac{d^2y}{dx^2}\right)^2 + \left(\frac{dy}{dx}\right)^2 = x\sin\left(\frac{dy}{dx}\right)is$

A. 1

B. 2

C. 3

D. not defined

Answer: D

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Others

1. Find the solution of $\frac{dy}{dx} = 2^{y-x}$

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2. Find the differential equation of all non-vertical lines in a plane.

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3. If $\frac{dy}{dx} = e^{-2y}$ and $y = 0$ when $x = 5$, then the value of x for $y = 3$ is

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4. Solve the following differential equation:

$$\frac{(x^2-1)dy}{dx}+2xy=\frac{1}{x^2-1};\ |x|\neq 1$$

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5. Solution of $\frac{dy}{dx}+2xy=y$ is (a) $(b)(c)y=c(d)e^{e}(f)x-(g)x^{((h)2(i))(j)(k)}(l)(m)$ (n) (b) $(o)(p)y=c(q)e^{r}(s)(t)x^{((u)2(v))(w)-x(x)}(y)(z)$ (aa) (c) $(d)(e)y=c(f)e^{(g)x(h)}(i)(j)$ (k) (d) $(l)(m)y=c(n)e^{o}(p)-(q)x^{((r)2(s))(t)(u)}(v)(w)$ (x)

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6. Find the general solution of $\frac{dy}{dx}+ay=e^{mx}$

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7. Solve the following differential equation: $\frac{dy}{dx} + 1 = e^{x+y}$

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8. Solve $ydx - xdy = x^2ydx$.

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9. Solve the differential equation $\frac{dy}{dx} = 1 + x + y^2 + xy^2$, when y=0 and x=0.

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10. Find the general solution of $\left(x+2y^3\right)\frac{dy}{dx}=y$

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11. If $y(x)$ is a solution of the differential equation $\left(\frac{2+\sin x}{1+y}\right)\frac{dy}{dx}=-\cos x$ and $y(0)=1$, then find the value of $y\left(\frac{\pi}{2}\right)$.

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12. If $y(t)$ is a solution of $(1+t)\frac{dy}{dt}-ty=1 and y(0)=-1$ then show that $y(1)=-\frac{1}{2}$.

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13. Form the differential equation having $y = \left(\sin^{-1} x\right)^2 + A\cos^{-1} x + B, where A and B$ are arbitrary constants, as its general solution.

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

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15. The equation of curve passing through origin and satisfying the differential equation $\left(1 + x^2\right)\frac{dy}{dx} + 2xy = 4x^2$, is

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16. Solve the following differential equation:

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

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17. Find the general solution of the following differential equation :

$$(1y2) + \frac{\left(x - e^{\tan \hat{} \left(\left(-1_{\mathrm{y}}\right)\right)}\right) dy}{dx} = 0$$

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18. Find the general solution of $y^2 dx + \left(x^2 - xy + y^2\right) dy = 0$

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19. Solve the following differential equations:

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

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20. Solve $2(y+3)-xy\frac{dy}{dx}=0$, given that $y(1)=-2$

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21. Solve the differential equation $\mathrm{dy}=\cos \mathrm{x}(2\text{-}\mathrm{y}\ \mathrm{cosec}\ \mathrm{x})\mathrm{dx}$ given that $y=2$, when $\mathrm{x}d=\frac{\pi}{2}$

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22. From the differential equation by eliminating A and B in

$Ax^2+By^2=1$

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23. Solve the following differential equation:

$\left(1+y^2\right)\tan^{-1}xdx+2y\left(1+x^2\right)dy=0$

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24. Find the differential equation of system of cocentric circles with centre (1,2)

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25. If $y+\frac{d}{dx}(xy)=x(\sin x+\log x)$, $y(x)$?

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26. Find the general solution of the differential equation $(1+\tan y)(dx-dy)+2xdy=0$

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

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28. Find the general solution of $\frac{dy}{dx}-3y=\sin 2x$

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29. The slope of the tangent at (x, y) to a curve passing through a point $(2, 1)$ is $\frac{x^2+y^2}{2xy}$, then the equation of the curve is (a) $(b)(c)2\Big((d)(e)(f)x^{(g)2(h)}(i)-(j)y^{(k)2(l)}(m)(n)\Big)=3x(o)$

(p) (b) [Math Processing Error] (ee) (c)

$(d)(e)x\left((f)(g)(h)x^{(i)2(j)}(k)-(l)y^{(m)2(n)}(o)(p)\right)=6(q)$ (r)

(d)

$(s)(t)x\left((u)(v)(w)x^{(x)2(y)}(z)+(aa)y^{(bb)2(cc)}(dd)(ee)\right)=10(ff)$

(gg)

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30. Find the equation of the curve through the point (1,0), if the slope of the tangent to the curve at any point (x,y) is $\frac{y-1}{x^2+x}$

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31. Find the equation of the curve passing through origin if the slope of the tangent to the curve at any point $(x, y)is$ equal to the square of the difference of the abscissa and ordinate of the point.

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32. Find the eqution of the curve passing through the point (1,1), if the tangent drawn at any point P(x,y) on the curve meets the coordinate axes at A and B such that P is the mid point of AB.

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

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34. The degree of the differential equation $\left[1 + \left(\frac{dy}{dx}\right)^2\right]^{3/2} = \frac{d^2y}{dx^2}$ is

A. 4

B. $\frac{3}{2}$

C. not defined

D. 2

Answer: D

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35. The order and degree of the differential equation $\frac{d^2y}{dx^2} + \left(\frac{dy}{dx}\right)^{1/4} + x^{1/5} = 0$ respectively are

A. 2 and 4

B. 2 and 2

C. 2 and 3

D. 3 and 3

Answer: A

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36. If $y = e^{-x}(A\cos x + B\sin x)$ then y is a solution of

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

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

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

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

Answer:

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37. The differential equation for $y = A\cos\alpha x + B\sin\alpha x$, where A and B are arbitary constant is

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

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

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

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

Answer: B

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38. The solution of differential equation xdy-ydx=0 represents

A. a reactangular hyperbola

B. parabola whose vertex is at orgin

C. straight line passing through origin

D. a circle whose centre is at origin

Answer: C

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39. The integrating factor of differential equation $\cos x \frac{dy}{dx} + y \sin x = 1$ is

A. cos x

B. tan x

C. sec x

D. sin x

Answer: C

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40. The solution of differential equation $\cos x \frac{dy}{dx} + y \sin x = 1$

A. $\tan x + \tan y = k$

B. $\tan x - \tan y = k$

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

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

Answer: D

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41. The family $y = Ax + A^3$ of curves is represents by differential equation of degree

A. 1

B. 2

C. 3

D. 4

Answer:

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42. The integrating factor of $\frac{xdy}{dx} - y = x^4 - 3x$ is

A. x

B. log x

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

D. $-x$

Answer:

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43. The solution of $\frac{dy}{dx} - y = 1, y(0) = 1$ is given by

A. $xy = -e^{x}$

B. $xy = -e^{-x}$

C. $xy = -1$

D. $y = 2e^{x} - 1$

Answer: D

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44. The number of solution of $\frac{dy}{dx} = \frac{y+1}{x-1}$ when $y(1) = 2$ is

A. none

B. one

C. two

D. inifinite

Answer:

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45. Which of the following is a second order differential equation

A. $(y')^2 + x = y^2$

B. $y'y'' + y = \sin x$

C. $y''' + (y'')^2 + y = 0$

D. $y' = y^2$

Answer:

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46. The integrating factor of differential euation $(1-x^2)\frac{dy}{dx} - xy = 1$ is

A. $-x$

B. $\frac{x}{1+x^2}$

C. $\sqrt{1-x^2}$

D. $\frac{1}{x}\log(1-x^2)$

Answer: C

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47. $\tan^{-1}x + \tan^{-1}y = C$ is general solution of the differential equation

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

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

C. $\left(1+x^2\right)dy + 1\left(1+y^2\right)dx = 0$

D. $\left(1+x^2\right)dx + 1\left(1+y^2\right)dy = 0$

Answer:

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48. The differential equation $y\frac{dy}{dx} + x = C$ represents

A. family of hyperbolas

B. family of parabolas

C. family of ellipses

D. family of circles

Answer: D

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49. The general solution of $e^x \cos y dx - e^x \sin y dy = 0$ is

A. $e^x \cos y = k$

B. $e^x \sin y = k$

C. $e^x = k \cos y$

D. $e^x = k \sin y$

Answer:

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50. The degree of differential equation $\frac{d^2y}{dx^2} + \left(\frac{dy}{dx}\right)^3 + 6y^5 = 0$ is

A. 1

B. 2

C. 3

D. 5

Answer:

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51. The solution of $\frac{dy}{dx} + y = e^{-x}, y(0) = 0$ is

A. $y = e^{x}(x - 1)$

B. $y = xe^{-x}$

C. $y = xe^{-x} + 1$

D. $y = (x + 1)e^{-x}$

Answer: B

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52. The integrating factor of differential equation $\frac{dy}{dx} + y\tan x - \sec x = 0$ is

A. cos x

B. sec x

C. $e^{\cos x}$

D. $e^{\sec x}$

Answer:

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53. The solution of differential equation $\frac{dy}{dx} = \frac{1+y^2}{1+x^2}$ is

A. $y = \tan^{-1} x$

B. $y - x = k(1 + xy)$

C. $x = \tan^{-1} y$

D. $\tan(xy) = k$

Answer:

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54. The integrating factor of differential equation $\frac{dy}{dx} + y = \frac{1 + y}{x}$ is

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

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

C. xe^x

D. e^x

Answer: B

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55. $y = ae^{mx} + be^{-mx}$ satisfies which of the following differential equation?

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

B. $\frac{dy}{dx} - my = 0$

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

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

Answer:

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56. The solution the differential equation

$\cos x \sin y \, dx + \sin x \cos y \, dy = 0$ is

A. $\frac{\sin x}{\sin y} = C$

B. $\sin x \sin y = C$

C. $\sin x + \sin y = C$

D. $\cos x \cos y = C$

Answer: B

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57. The solution of $x\frac{dy}{dx} + y = e^x$ is

A. $y = \frac{e^x}{x} + \frac{k}{x}$

B. $y = \frac{e^x}{x} + \frac{k}{x}$

C. $y = xe^x + k$

D. $x = \frac{e^y}{y} + \frac{k}{y}$

Answer:

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58. The differential equation of the family of curves of $x^2 + y^2 - 2ay = 0$ where a is arbitary constant, is

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

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

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

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

Answer:

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59. The family $y = Ax + A^3$ of curves is represents by differential equation of degree

A. 3

B. 2

C. 1

D. not defined

Answer:

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

A. $e^{x^2-y} = C$

B. $e^{-y} + e^{x^2} = C$

C. $e^y = e^{x^2} + C$

D. $e^{x^2+y} = C$

Answer:

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61. The curve for which the slope of the tangent at any point is equal to the ration of the abcissa to the ordinate of the point is

A. an ellipse

B. parabola

C. circle

D. rectangular hyperbola

Answer:

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62. The general solution of differential equation $\frac{dy}{dx} = e^{\frac{x^2}{2}} + xy$ is

A. $y = Ce^{-x^2/2}$

B. $y = Ce^{x^2/2}$

C. $y = (x + C)e^{x^2/2}$

D. $y = (C - x)e^{x^2/2}$

Answer:

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63. The solution of equation $(2y - 1)dx - (2x + 3)dy = 0$ is

A. $\frac{2x - 1}{2y + 3} = k$

B. $\frac{2y + 1}{2x - 3} = k$

C. $\frac{2x+3}{2y-1} = k$

D. $\frac{2x-1}{2y-1} = k$

Answer: C

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64. The differential equation for which $y = a\cos x + b\sin x$ is a solution is

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

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

C. $\frac{d^2y}{dx^2} + (a+b)y = 0$

D. $\frac{d^2y}{dx^2} + (a-b)y = 0$

Answer:

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65. The solution of $\frac{dy}{dx} + y = e^{-x}, y(0) = 0$ is

A. $y = e^{-x}(x - 1)$

B. $y = xe^{x}$

C. $y = xe^{-x} + 1$

D. $y = xe^{-x}$

Answer: D

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66. The order and degree of differential equation:

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

A. 1,4

B. 3,4

C. 2,4

D. 3,2

Answer:

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67. The order and degree of differential equation: $\left[1+\left(\frac{dy}{dx}\right)^2\right]=\frac{d^2y}{dx^2}$ are

A. $2, \frac{3}{2}$

B. 2,3

C. 2,1

D. 3,4

Answer: C

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68. The differential equation of family of curves of $y^2 = 4a(x + a)$ is

A. $y^2 = 4\dfrac{dy}{dx}\left(\dfrac{x + dy}{dx}\right)$

B. $2y\dfrac{dy}{dx} = 4a$

C. $\dfrac{d^2y}{dx^2} + \left(\dfrac{dy}{dx}\right)^2 = 0$

D. $2x\dfrac{dy}{dx} + \left(\dfrac{dy}{dx}\right)^2 - y = 0$

Answer:

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69. Which of the following is a general solution of $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + y = 0$

A. $y = (Ax + B)e^x$

B. $y = (Ax + B)e^{-x}$

C. $y = Ax^x + Be^{-x}$

D. $y = A\cos x + B\sin x$

Answer: A

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70. The general solution of $\frac{dy}{dx} + y\tan x = \sec x$ is

A. $y\sec x = \tan x + C$

B. $y\tan x = \sec x + C$

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

D. $x \sec x = \tan y + C$

Answer: A

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71. The solution of differential equation $\frac{dy}{dx} + \frac{y}{x} = \sin x$ is

A. $x(y + \cos x) = \sin x + C$

B. $x(y - \cos x) = \sin x + C$

C. $xy \cos x = \sin x + C$

D. $x(y + \cos x) = \cos + C$

Answer: B

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72. The general solution of differential equation $(e^x+1)ydy=(y+1)(e^x)dx$is

A. $(y+1)=k(e^x+1)$

B. $y+1=e^x+1+k$

C. $y=\log\{k(y+1)(e^x+1)\}$

D. $y=\log\left\{\frac{e^x+1}{y+1}\right\}+k$

Answer:

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73. The solution of differential equation $\frac{dy}{dx}=e^{x-y}+x^2e^{-y}$is

A. $y=e^{x-y}-x^2e^{-y}+C$

B. $e^y-e^x=\frac{x^3}{3}+C$

C. $e^x + e^y = \frac{x^3}{3} + C$

D. $e^x - e^y = \frac{x^3}{3} + C$

Answer: B

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74. The solution of differential equation $\frac{dy}{dx} + \frac{2xy}{1+x^2} = \frac{1}{(1+x^2)^2}$ is

A. $y(1+x^2) = C + \tan^{-1} x$

B. $\frac{y}{1+x^2} = C + \tan^{-1} x$

C. $y \log(1+x^2) = C + \tan^{-1} x$

D. $(1+x^2) = C + \sin^{-1} x$

Answer:

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75. (i) The degree of the differential equation $\frac{d^2y}{dx^2} + e^{dy/dx} = 0$ is...

(ii) The degree of the differential equation $\sqrt{1 + \left(\frac{dy}{dx}\right)^2} = \text{x is.....}$

(iii) The number of arbitrary constant in the general solution of differential equation of order three is..

(iv) $\frac{dy}{dx} + \frac{y}{x \log x} = \frac{1}{x}$ is an equation of the type....

(v) The solution of the differential $\frac{xdy}{dx} + 2y = x^2$ is....

(vi) The solution of the differential equation $ydx + \left(x + (x)^2 y\right)dy = 0$ is ....

(vii) Genergal solution of $\frac{dy}{dx}\Big) + y = \sin x$ is....

(viii) The solution of differential equation cot y $dx = xdy$ is....

(ix) The integrating factor of $\frac{dy}{dx} + y = \frac{1+y}{x}$ is.....

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76. State True and False for the following

(i) Integrating factor of the differential of the form $\frac{dx}{dy} + p_1 x = Q_1$ is given by $e^{\int P_1 dy}$.

(ii) Solution of the differential equation of the type $\frac{dx}{dy} + P_1 x = Q_1$ is given by $x \cdot IF = \int (IF) \times Q_1 dy$. (iii) Correct substitution for the solution of the differential equation of the type $\frac{dy}{dx} = f(x, y)$, where $f(x, y)$ is homogeneous function of zero degree is y = vx.

(iv) Correct substitution for the solution of the differential equation of the type $\frac{dy}{dx} = g(x, y)$, where $g(x, y)$ is a homogeneous function of the degree zero is $x = vy$.

(v) Number of arbitrary constants in the particular solution of a differential equation of order two is two.

(vi) The differential equation representing the family of circles $x^2 + (y - a)^2 = a^2$ will be of order two.

(vii) The solution of $\frac{dy}{dx} = \left(\frac{y}{x}\right)^{1/3}$ is $y^{2/3} - x^{2/3} = c$

(viii) Differential equation representing the family of curve

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

(ix) The solution of the differential equation $\frac{dy}{dx} = \frac{x+2y}{x}$is $x + y = kx^2.$

(x) Solution of $\frac{xdy}{dx} = y + x\tan\frac{y}{x}$is $\sin\left(\frac{y}{x}\right) = cx$

(xi) The differential equation of all non horizontal lines in a plane is $\frac{d^2x}{dy^2} = 0.$

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