# MATHS

## BOOKS - CHHAYA PUBLICATION MATHS (BENGALI ENGLISH)

## DIFFERENTIAL EQUATIONS OF THE FIRST ORDER AND FIRST DEGREE

### Example

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

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

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**3.** $dx-dy+ydx+xdy=0$

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

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**5.** $x^2(4+y^2)dx+y^2(4+x^2)dy=0$

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**6.** $2^{x-y}dx + 2^{y-x}dy = 0$

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

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

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**9.** $x^2 + y^2 = \log(ydy) - \log(xdx)$

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**10.** $x\cos^2 y dx - y\cos^2 x dy = 0$

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**11.** $\frac{dy}{dx} = \frac{\cos(\log x)}{\log_e y}$

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**12.** $\frac{dy}{dx} = \frac{\cos^4 y}{\sin^4 x + \cos^4 x}$

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**13.** $(\cos y + y\cos x)dx + (\sin x - x\sin y)dy = 0$

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

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15. $(e^y + 1)xdx = (x + 1)e^y dy$

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16. $\tan xdy - \tan ydx = 0$, given $y = \frac{\pi}{2}$, when $x = \frac{\pi}{4}$

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**17.** $\cos y dx + \left(1 + e^{-x}\right) \sin y dy = 0, \quad \text{give} \quad y = \frac{\pi}{4}$ when x=0

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**18.** A curve passes through the point (5,3) and the product of its slope and ordinate at any point (x,y) is equal to its abscissa. Find the equation of the curve.

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**19.** A particle starts with the veloctiy u and moves in a straight line, its acceleration being always equal to its displacement. If v be the velocity when its displacement is x, the show that $v^2 = u^2 + x^2$.

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

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

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**22.** $\log \frac{dy}{dx} = 4x - 2y - 2,$ given y=1, when x=1

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**23.** $\frac{dy}{dx} = \sqrt{y-x}$

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

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**25.** $xdx + ydy + \frac{xdy - ydx}{x^2 + y^2} = 0$, given y=1, when x=1

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**26.** $y\frac{dy}{dx}\sin x = \cos x\left(\sin x - \frac{y^2}{2}\right), y = 1 \text{ when } x = \frac{\pi}{2}$

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

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**28.** $x\frac{dy}{dx} = y + x\tan\frac{y}{x}$, given $y = \frac{\pi}{2}$, when x=1

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**29.** $(x^2 + y^2)dx - 2xydy = 0$, given y=0 when x=1

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**30.** $\left(1 + 3e^{\frac{y}{x}}\right)dy + 3e^{\frac{y}{x}}\left(1 - \frac{y}{x}\right)dx = 0$

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**31.** $xdy - ydx = 2\sqrt{y^2 - x^2}dx$

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**32.** $\frac{dy}{dx} = \frac{2x - 3y + 4}{3x + 4y - 5}$

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**33.** $(6x + 9y - 7)dx = (2x + 3y - 6)dy$

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**34.** $\frac{dy}{dx} = \frac{\sin 2y}{x + \tan y}$

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**35.** A particle starts from the origin with a velocity 5 cm/s and moves in a straight line its accelration at time t seconds being $(3t^2 - 5t)cm/s^2$. Find the velocity of the particle and its distance from the origin at the end of 4 seconds.

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**36.** The population of country increases at the rate proportional to the number of inhabitants. If the population doubles in 30 years, in how many years will it treble? Given $\log_e 3 = 1.6 \log_e 2$.

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**37.** In a certain culture, the number of bacteria at any instant increases at a rate proportional to the square root of the number present at that instant. If the number becomes 16 times in 5 hours, when the number will be 49 times?

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**38.** A radioactive substance is subject to the law of natural decay $\frac{dv}{dt} = -kv$, where v is the volume of the substance at time t and k is a positive constant. The half-life of the substance is the time it takes for half the substance to disappear. Calcualte the half-life if 20 % of the substance disappeared in 15 years.

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**39.** The marginal cost of a commodity is given by Rs $(27 - 32x + 9x^2)$ , where x is the output. Find the total cost and average cost function, given that the initial cost is RS 50.

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**40.** If the marginal function for x units of output is given by $\frac{6}{(x+2)^2} + 5$, find the total revenue function and the demand law.

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## Exercise 11

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

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

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

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

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

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**6.** $\frac{dy}{dx}=\sqrt{4-y^2}$

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**7.** $y(1+x)dx+x(1+y)dy=0$

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

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

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10. $\frac{dy}{dx} = y\sin 2x$ given, y(0)=1

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11. $3^{y-x}dy - 3^{x-y}dx = 0$

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12. $ydx + \left(1+x^2\right)\tan^{-1}xdy = 0$

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**13.** Show that, the general solution of $(1+x^2)dy+(1+y^2)dx=0$ is x+y=c(1-xy) where c is an arbitrary constant.

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**14.** Show that the general solution of the equation dy=ylogxdx is $y=c\left(\frac{x}{e}\right)^x$, where c is an arbitrary constant.

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**15.** Find the particular solution of

$$a^2y\frac{dy}{dx}+b^2x=0, \text{given } \ y=\frac{b}{\sqrt{2}}, \text{when} x=\frac{a}{\sqrt{2}}$$

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**16.** Find the particular solution of

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

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**17.** Find the particular solution of

$v\frac{dv}{dx} = n^2 x$, given v=u when x=a

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**18.** Find the particular solution of

$\frac{dy}{dx} = y \sec x$, given y=1, when $x = \frac{\pi}{6}$

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**19.** Find the particular solution of

$ydx + xdy = xy(dy - dx)$, given y=1 when x=1

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**20.** Find the particular solution of

$\frac{dy}{dx} = e^{4x - 3y}$, given y=0 when x=0

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**21.** Find the particular solution of

$\log\left(\frac{dy}{dx}\right) = 3x - 5y$

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**22.** Find the particular solution of

$(x-y)(dx+dy)=dx-dy,$ given y=1, when x=0

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**23.** Find the particular solution of

$y^2(xdy+ydx)+xdy-ydx=0$

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**24.** Find the particular solution of

$(ax+hy+g)dx+(hx+by+f)dy=0$

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## Part A

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

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

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3. $\left(1 + y^2\right)(1 + \log x)dx + xdy = 0$, given y=1, when x=1

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

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**5.** $ydy + xe^x \cos^2 ydx = 0$

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

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**7.** $\frac{dy}{dx} = \log(x+1)$

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

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

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10. $\cos y \log(\sec x + \tan x) dx = \cos x \log(\sec y + \tan y) dy$

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11. $x^2 \frac{dy}{dx} = y^2 - 5y + 6$

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

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**13.** $y\left(1-x^2\right)dy = x\left(1+y^2\right)dx$

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

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**15.** $(e^x+1)ydy - \left(y^2+1\right)e^x dx = 0$ , given y=0 when x=0`

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

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17. $(e^y+1)\cos x dx + e^y \sin x dy = 0$

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

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

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**20.** $e^x \tan y dx + (1 - e^x)\sec^2 y dy = 0$

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

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**22.** $\left(1 + e^{2x}\right) dy + e^x \left(1 + y^2\right) dx = 0$ it being given that y=1 when x=0

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**23.** $\frac{dy}{dx} = \frac{\cos(\log x)}{\log_e y}$

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**24.** $\left(y - x\frac{dy}{dx}\right) = a\left(y^2 + \frac{dy}{dx}\right)$

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**25.** $\frac{dy}{dx} + \frac{\sqrt{(x^2-1)(y^2-1)}}{xy} = 0$

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**26.** Show that the general solution of the differential equation

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

is $x\sqrt{1-y^2}+y\sqrt{1-x^2}=c$, where c is an arbitray constant.

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**27.** Find the particular solution of each of the following equations:

$\tan x\frac{dy}{dx}=1+y^2$, given y=1 when $x=\frac{\pi}{2}$

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**28.** Find the particular solution of each of the following equations:

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

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**29.** Find the particular solution of each of the following equations:

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

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**30.** Find the particular solution of each of the following equations:

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

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## Part B

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

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

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

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

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**5.** $(x+y+1)\frac{dy}{dx}=1$

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**6.** $\frac{dy}{dx}=\sqrt{x+y+1}$

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

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

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

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

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

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

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

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14. Prove that the variables in the equation $\frac{dy}{dx} = f(ax + by + c)$ can be separate by the substitution ax+by+c=z.

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## Part C

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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**17.** $y^2 dx + \left(x^2 - xy\right) dy = 0$

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**18.** $\dfrac{dy}{dx} = \dfrac{y(y+x)}{x(y-x)}$

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**19.** $xdy - ydx = \left(x^2 - 3xy + 2y^2\right) dx = 0$

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**20.** Solve the following differential equation

$$xdy - ydx = \sqrt{x^2 + y^2}dx$$

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**21.** $y^2dx + \left(x^2 - xy\right)dy = 0$

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**22.** $xy\frac{dy}{dx} - y^2 = (x + y)2_e^{-\frac{y}{x}}$

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

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**24.** $\left(1+e^{\frac{x}{y}}\right)dx+e^{\frac{x}{y}}\left(1-\frac{x}{y}\right)dy=0$

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

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**26.** $x(ydx+xdy)\cos(xy)+\sin(xy)dx=0$

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**27.** Find the particular solutions of the following equations:

$\frac{dy}{dx} = \frac{3x + 2y}{2x - 3y}$ , given y=0 ,when x=1.

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**28.** Find the particular solutions of the following equations:

$\frac{dy}{dx} = \frac{4x + y}{x + y}$ , given y=4, when x=1

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**29.** Find the particular solutions of the following equations:

$\frac{dy}{dx} - \frac{y}{x} + \cos ec\left(\frac{y}{x}\right) = 0$, given y=0 when x=1.

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## Part D

1. $\frac{dy}{dx} = \frac{4x - 5y + 3}{5x + y - 2}$

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2. $\frac{dy}{dx} = \frac{3x + 4y + 1}{-4x + 2y - 3}$

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3. $(6x + 5y - 2)dx + (5x - 3y + 2)dy = 0$

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

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5. $\frac{dy}{dx} = \frac{x+y+1}{x+y-1}$, given y=1, when x=1

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6. $(2x-2y+5)dy = (x-y+3)dx$

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

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**8.** $(x+y+1)dx+(2x+2y-1)dy=0$

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**9.** $(2x+4y+3)\frac{dy}{dx}=2y+x+1$

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**10.** Find the paraticular solutions of the following equations:

$\frac{dy}{dx}=\frac{1-3x-3y}{2x+2y}$, given y=1, when x=-1

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**11.** Find the paraticular solutions of the following equations:

$(6x - 4y + 3)dx - (3x - 2y + 1)dy = 0$ , given y=4, when x=2

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## Part E

**1.** If f' (x) $= xe^x$ and f(0)=1, find f(x)

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**2.** If f'(x)=logx and f(1)=0, show f(x)=x(logx-1)+1.

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**3.** A curve passes through the point (3,-4) and the slope of the tangent to the curve at any point (x,y) is $\left(-\frac{x}{y}\right)$. Find the equation of the curve.

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**4.** Determine the equation of the passing through the origin, the slope of the tangent of which at any point (x,y) is $\frac{x+1}{y+1}$.

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**5.** The slope of the tangent to a curve at any point (x,y) is $\frac{3y+2x+4}{4x+6y+5}$. If the curve passes through (0,-1), find the equation of the curve.

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**6.** 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 $x^2-y^2=cx$

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**7.** A curve is passing through the point (4,3) and at any point the gradient of the tangent to the curve is reciprocal of the ordinate of the point. Obtain the equation of the curve.

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**8.** Show that, the equation of the curve passing through (1,0) and satisfying $\left(1+y^2\right)dx-xydy=0$ is $x^2-y^2=1$

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**9.** A curve passes through tha point (2,0) and satisfies the equation ydy+4dx=0, show that the curve is a parabola and find the length of its latus rectum.

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**10.** A motor boat is moving in a straight line. Its velocity is V when the motor is shut off. If the retardation at any subsequent time is equal to the magnitude to its velocity at that time, find its velocity and the distance travelled in time t after the motor is shut off.

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**11.** A particle starts from the origin and moves along a straight line. If the velocity of the particle at time t seconds be 10t cm/s, find the distance traversed during first 4 seconds after the start.

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**12.** The velocity of a particle moving in a straight path is given by $v = 16t - 4t^2$ where v and t measured in ft/s and second units respectively. If the initial displacement be 10 ft, find the displacement of the particle in t seconds.

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**13.** The acceleration of a particle moving along a straight line is $(6t^2 - 3t)cm/s^2$, at time t seconds. If the velocity of the particel at time 2 seconds be 10cm/s, find its velocity at time t seconds.

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**14.** If the acceleration of a particle at time t seconds be $1.2t^2 ft/s^2$ and velocity of the particle at time 2 seconds be 2.2 ft/s, then find its velocity at time 5 seconds.

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**15.** A particle starts form the origin with a velocity of 10 cm/s and moves along a straight line. If its acceleration be

$(2t^2 - 3t)cm/s^2$ at the end of t seconds, then fing its velocity and the distance from the origin at the end of 6 seconds.

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**16.** A particle starts from the origin with a velocity of 2 cm/s and moves along a straight line. If the acceleration of the particle at a distance x cm from the origin be $\left(2x - \frac{3}{2}\right)\frac{cm}{s^2}$, find the velocity of the particle at a distance 7 cm from the origin.

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**17.** In a certain culture, the number of bacteria at any instant increases at a rate proportional to the cube root of the

number present at that instant. If the number becomes 8 times in 3 hours, when the number will be 64 times?

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**18.** A radioactive substance is subject to the law of natural decay $\frac{dv}{dt} = -kv$ where v is the valume of the substance at time t and k is a positive constant. If 40% of the substance disappear in 25 years, find the time it takes to disappear 60% of the substance.

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**19.** Suppose the marginal cost of a product is given by $RS(10 + 24x - 3x^2)$, where x is the number of units

produced. It the fixed cost is known to be RS 40, find the total cost function and the average cost function.

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**20.** If the marginal revenue function is $(15 - 2x - x^2)$, find total revenue function and the demand function (x being the number units sold).

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**21.** The marginal cost function of manufacturing x pairs of shoes is $RS(6 + 10x - 6x^2)$. The total cost of producing a pair of shoes is RS 12. Find the total and average cost functions.

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**22.** If y is the total cost of x units of output and it is given that marginal cost equals average cost, show that the average cost function is constant.

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## Multiple Correct Answers Type

**1.** Which one of the following functions is/are homogenous?

A. $f(x, y) = \dfrac{x - y}{x^2 + y^2}$

B. $f(x, y) = x^{\frac{1}{3}} y^{-\frac{2}{3}} \tan^{-1} \dfrac{x}{y}$

C. $f(x, y) = x\left(\log \sqrt{x^2 + y^2} - \log(x) + ye^{\frac{x}{y}}\right.$

D.

$$f(x, y) = x\left[\log \frac{2x^2 + y^2}{x} - \log(x + y)\right] + y^2 \tan \frac{x + 2y}{3x - y}$$

**Answer: A::B::C**

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**2.** The solutions of (x+d+1)dy=dx are-

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

B. $x + y + 4 = c \log y$

C. $\log(x + y + 2) = cy$

D. $\log(x + y + 2) = c + y$

**Answer: A::D**

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**3.** The solutions of $\frac{dy}{dx} = \frac{x^2 + y^2 + 1}{2xy}$ satisfying y(1)=1 is given by -

A. a system of hyperbola

B. a system of circles

C. $y^2 = x(1 + x) - 1$

D. $(x - 2)^2 + (y - 3)^2 = 5$

**Answer: A::C**

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**4.** The solutions of $\frac{xdx + ydy}{xdy - ydx} = \sqrt{\frac{a^2 - x^2 - y^2}{x^2 + y^2}}$ is

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

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

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

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

**Answer: A::D**

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**5.** The solutions of $p+\cos px\sin y=\sin px\cos y,\left(p=\frac{dy}{dx}\right)$ is-

A. y=0

B. $cx^2-y=\sin^{-1}x$

C. $cx-y=\sin^{-1}c$

D. $y = \sqrt{x^2 - 1} - \sin^{-1} \frac{\sqrt{x^2 - 1}}{x}$

**Answer: A::C::D**

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## B Integer Answer Type

**1.** If $\frac{dy}{dx} - x \tan(y - x) = 1, y(0) = \frac{\pi}{2}$ then the value of $\sin\{y(4) - 4\}e^{-8}$ is

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**2.** If $\frac{dy}{dx} + \frac{y}{\sqrt{x^2 + a^2}} = 3x, y(0) = a^2$ then the value of $\frac{y\left(\sqrt{3a}\right)}{a^2} \cdot \frac{8 - 3\sqrt{3}}{2 - \sqrt{3}}$ is equal to 19k, then find k.

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**3.** If a curve satisfying $xy_1 - 4y - x^2\sqrt{y} = 0$ passes through $\left(1, (\log 4)^2\right)$ then the value of $\frac{y(2)}{(\log 32)^2}$ is-

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**4.** If the solution of $\frac{x}{x^2 + y^2}dy = \left(\frac{y}{x^2 + y^2} - 1\right)dx$ satisfies y(0)=1 then the value of $\frac{16}{\pi}y\left(\frac{\pi}{4}\right)$ is-

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**5.** If the curve satisfying $\left(1 + e^{\frac{x}{y}}\right)dx + e^{\frac{x}{y}}\left(1 - \frac{x}{y}\right)dy = 0$ passes through (1,1) then $9 + y(2)e^{\frac{2}{y(2)}} - e$ is equal to-

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## C Matrix Match Type

**1.** If $f''(x) = \left(x^2 - a^2\right)$, find f(x).

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**2.** If $f''(x) = \left(x^2 + a^2\right)$, find f(x).

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## D Comprehension Type

**1.** Consider the homogeneous differential equation $\frac{dy}{dx} = f\left(\frac{y}{x}\right)$ By putting $\frac{y}{x} = v$, the equation reduces to $\frac{dv}{f(v) - v} = \frac{dx}{x}$. Integrating we get $\int \frac{dv}{f(v) - v} = \int \frac{dx}{x} + c$

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

A. $y^2 = c^2 e^{\frac{2y}{x}}$

B. $y = ce^{\frac{2y}{x}}$

C. $y^2 = ce^{\frac{y}{2x}}$

D. $y^2 = c^2 e^{\frac{y^2}{x}}$

**Answer: A**

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**2.** Consider the homogeneous differential equation $\frac{dy}{dx} = f\left(\frac{y}{x}\right)$ By putting $\frac{y}{x} = v$, the equation reduces to $\frac{dv}{f(v) - v} = \frac{dx}{x}$. Integrating we get $\int \frac{dv}{f(v) - v} = \int \frac{dx}{x} + c$

Solution of $xy\frac{dy}{dx} - y^2 = (x + y)^2 e^{\frac{-y}{x}}$ is

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**3.** Consider the homogeneous differential equation $\frac{dy}{dx} = f\left(\frac{y}{x}\right)$ By putting $\frac{y}{x} = v$, the equation reduces to $\frac{dv}{f(v) - v} = \frac{dx}{x}$. Integrating we get $\int \frac{dv}{f(v) - v} = \int \frac{dx}{x} + c$

Solution of $\left(x + y\cos\frac{y}{x}\right)dx = x\cos\frac{y}{x}dy$ is

A. $\cos\frac{y}{x} = \log|x| + c$

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

C. $\sin\frac{y}{x} = \log|xc|$

D. $\cos \frac{y}{x} = \log|yc|$

**Answer: C**

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**4.** If $f'(x) = \frac{2x}{(1+x^2)^2}$, find f(x).

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**5.** If $2f''(x) = \sin x - 49\sin 7x$, find f(x).

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**6.** If $f'(x) = 3\sin x - 4\cos x$, find f(x).

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## E Assertion Reason Type

**1.** Let y(x) be a solution of $xdy + ydx + y^2(xdy - ydx) = 0$ satsfying y(1)=1

Statement -I : The range of y(x) has exactly two points.

Statement0-II : The constant of integration is zero.

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**2.** Let a solution y=y(x) of the differential equation $x\sqrt{x^2 - 1}dy - y\sqrt{y^2 - 1}dx = 0$ satisfy $y(2) = \frac{2}{\sqrt{3}}$

Statement- I : $y(x) = \sec\left(\sec^1 x - \frac{\pi}{6}\right)$

Statement-II : y(x) is given by $\frac{1}{y} = \frac{2\sqrt{3}}{x} = \sqrt{1 - \frac{1}{x^2}}$

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