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Where Minds Pollinate

Class 12
Mathematics

Chapter 4

Review Exercise 4

Handwritten Solution

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Review # 4

Q2 (i) $x\left(\frac{dy}{dx}\right)^2 + 2\sqrt{xy}\,\frac{dy}{dx} + y = 0$

Solution: order = 1

degree = 2.

(ii) $\frac{dy}{dx} = \sqrt{1+\left(\frac{d^2y}{dx^2}\right)^4}$

Sol: order = 2

degree = 4

Q3) (i) $2\frac{dy}{dx} + y = 0$; $y = e^{-x/2}$

Solution:

$y = e^{-x/2}$

$\frac{dy}{dx} = e^{-x/2}\left(\frac{-1}{2}\right)$;

$2\left[e^{-x/2}\left(\frac{-1}{2}\right)\right] + e^{-x/2} = 0$.

$-e^{-x/2} + e^{-x/2} = 0$

$0 = 0$ Proved.

(ii) $\frac{dy}{dx} + 20y = 24$; $y = \frac{6}{5} - \frac{6}{5}e^{-20x}$

Sol: $\frac{dy}{dx} = 24e^{-20x}$

$24e^{-20x} + 20\left(\frac{6}{5} - \frac{6}{5}e^{-20x}\right) = 24$

$24e^{-20x} + 20\left(\frac{6}{5}\right) - 20\left(\frac{6}{5}e^{-20x}\right) = 24$

$24e^{-20x} + 24 - 24e^{-20x} = 24$

$24 = 24$ proved.

(iii) $\frac{dy}{dx} = 25 + y^2$; $y = 5\tan 5x$

Sol: $\frac{dy}{dx} = 5\sec^2 5x \cdot 5$

$\boxed{\frac{dy}{dx} = 25\sec^2 5x}$

$25\sec^2 5x = 25 + 25\tan^2 5x$

$25\sec^2 5x = 25(1 + \tan^2 5x)$

$25\sec^2 5x = 25\sec^2 5x$ proved

(04) (i) $\frac{dy}{dx} = x\ln x$

Sol $\int dy = \int x\ln x\, dx$

$y = \ln x \int x\,dx - \int\left[\int x\,dx \cdot \frac{d}{dx}(\ln x)\right]dx$

$y = \ln x \cdot \frac{x^2}{2} - \int\left(\frac{x^2}{2} \cdot \frac{1}{x}\right)dx$

$y = \frac{x^2}{2}\ln x - \frac{1}{2}\int x\, dx$

$y = \frac{x^2}{2}\ln x - \frac{1}{2}\frac{x^2}{2} + C$ Answer.

(ii) $(y+1)\frac{dy}{dx} + x\sin x = 0$

Sol: $dy(y+1) = -x\sin x\, dx$

$$\frac{y^2}{2}+y = -\left[x\int \sin x\,dx - \int\left(\int \sin x\,dx \cdot \frac{d}{dx}(x)\right)dx\right]$$

$$\frac{y^2}{2}+y = -\left[-x\cos x - \int -\cos x \cdot (1)\,dx\right]$$

$$\boxed{\frac{y^2}{2}+y = x\cos x - \sin x + c}$$ Answer.

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

Sol: let $y = vx$

$\frac{dy}{dx} = v*1 + x\frac{dv}{dx}$

$v + x\frac{dv}{dx} = \frac{x^2+v^2x^2}{xvx}$

$x\frac{dv}{dx} = \frac{1+v^2-v^2}{v}$

$x\frac{dv}{dx} = \frac{1}{v}$

$x\,dx = \frac{1}{v}dx$

$v\,dv = \frac{1}{x}dx$

$\frac{v^2}{2} = \ln x + C$

$\frac{(y/x)^2}{2} = \ln x + C$

$\frac{y^2}{x^2}\cdot\frac{1}{2} = \ln x + C$

$\boxed{\frac{y^2}{2x^2} = \ln x + C}$

$x=1 \quad y=2$

$\frac{4}{2} = \ln 1 + C$

$\boxed{C=2}$

put in (1).

$\boxed{\frac{y^2}{2x^2} = \ln x + 2}$

$\frac{y^2}{2x^2} - 2 = \ln x$

$\frac{y^2-4x^2}{2x^2} = \ln x$

$e^{\frac{y^2-4x^2}{2x^2}} = e^{\ln x}$

$\boxed{x = e^{\frac{y^2-4x^2}{2x^2}}}$ Answer