DIFFERENTIAL EQUATIONS

HOMOGENEOUS DIFFERENTIAL EQUATIONS

EXERCISE

Q.1 Find the solutions to the following differential equations:

(1) $\left(x\frac{dy}{dx}-y\right)\tan^{-1}\frac{y}{x}=x$ Given that $y=0$ at $x=1$

(2) $x\frac{dy}{dx}=y-x\tan\frac{y}{x}$

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

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

(5) $\frac{dy}{dx}=\frac{3x+2y-5}{3y-2x+5}$

Q.2 Find $x^2dy + y(x + y)\,dx = 0$

Q.3 Solve: $(x^2 - y^2)\,dx + 2xydy = 0$ given that $y = 1$ when $x = 1$

Q.4 Evaluate the differential equation $\frac{dy}{dx}=\frac{x+2y-5}{2x+y-4}$

Q.5 Solve $\frac{dy}{dx}=\frac{yf'(x)-y^2}{f(x)}$

Q.6 Evaluate $\frac{dy}{dx}=\frac{x-2y+5}{2x+y-1}$

ANSWER KEY

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

(2) $x\sin\frac{y}{x}=C$

(3) $x + y = c\,(x - y + 6)^3$

(4) $3(2y-x)+\ln(3x+3y+4)=C$

(5) $3x^2+4xy-3y^2-10x-10y=C$

2. $\left|\frac{vx^2}{v+2}\right|=c \Rightarrow \left|\frac{x^2y}{2x+y}\right|=c; c>0$

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

4. $x+y-3=c'(x-y+1)^3$

5. $\frac{f(x)}{y}=x+c$ or $f(x)=y(x+c)$

6. $x^2-4xy-y^2+10x+2y=c'$ Where $c'=-2c$