

## Worksheet #02

Solve the following Homogeneous D.E's.

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

Ans:  $\frac{x}{y} = \ln x + C$

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

Ans:  $x^2 + y^2 = ax$

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

Ans:  $\frac{y}{x} - \ln xy = C$

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

Ans:  $y = x \ln c$

5.  $\frac{dy}{dx} + \frac{x-2y}{2x-y} = 0$

Ans:  $y-x = c(x+y)^3$

6.  $\frac{dy}{dx} = \tan\left(\frac{y}{x}\right) + \frac{y}{x}$

Ans:  $\sin\left(\frac{y}{x}\right) = Cx$

7.  $\frac{dy}{dx} = \frac{3xy + y^2}{3x^2}$

Ans:  $3x + y \ln x + cy =$

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

Ans:  $4y^2 - x^2 = \frac{c}{x^2}$

9.  $(x^2 + y^2)dy = xydx$

Ans:  $-\frac{x^2}{2y^2} + \ln y = C$

10.  $[x \cos\left(\frac{y}{x}\right) + y \sin\left(\frac{y}{x}\right)]y - [y \sin\left(\frac{y}{x}\right) - x \cos\left(\frac{y}{x}\right)]x \frac{dy}{dx} = 0$

Ans:  $xy \cos \frac{y}{x} = a$

## Reducible to Homogeneous

1.  $\frac{dy}{dx} = \frac{2x+9y-20}{6x+2y-10}$

Ans:  $(2x-y)^2 = c(x+2y-5)$

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

Ans:  $\ln[(y+3)^2 + (x+2)^2] + 2 \tan^{-1}\left(\frac{y+3}{x+2}\right) = C$

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

Ans:  $(y+4)^2 + 2(x+2)(y+4) - (x+2)^2 = C$

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

Ans:  $-(y-3)^2 + 2(x+1)(y-3) + (x+1)^2 = C$

5.  $\frac{dy}{dx} = \frac{2x-5y+3}{2x+4y-6}$

Ans:  $(x-4y+3)(2x+y-3) = C$

6.  $(2x+y+1)dx + (4x+2y-1)dy = 0$  Ans:  $2(2x+y) + \ln(2x+y-1) = 3x+C$

7.  $(x-y-2)dx - (2x-2y-3)dy = 0$  Ans:  $\ln(x-y-1) = x-2y+C$

8.  $(6x-4y+1)dy - (3x-2y+1)dx = 0$  Ans:  $4x-8y - \ln(12x-xy+1) = C$

9.  $(7y-3x+3)dy = -(3y-2x+7)dx$  Ans:  $(x+y-1)^5(x-y-1)^2 = 1$

10.  $(y-3x+3)dy = (2y-x-4)dx$  Ans:  $x^2-5xy+y^2 = c \left[ \frac{2y+(-5+12i)x}{2y-(5+12i)x} \right]^{\frac{1}{2}}$

For question put appropriate value of  $x = x+h, \dots$