

Paper: BSM 3-Algebra-III and Differential equations-I  
(SSC 540)

**Programme**

**B.Sc**

Subject

Mathematics

Semester

III

University

Kuvempu University

Session

38

# Differential Equations of First order and First Degree

## Homogeneous Differential Equations

## Recap of previous class

- Solution of DE by separation of variables  
i.e the solution of the equation of the form

$$Mdx + Ndy = 0$$

where M is a function of x alone and N is a function of y alone is

$$\int M dx + \int N dy = c$$

# Learning Objectives

- Problems on Homogeneous differential equation

## Session Outcome:

- Student will be able to solve homogeneous differential equations of first order and first degree.

## Prerequisites :

- Standard formulae of differentiation
- Standard formulae of integration
- Solution of DE in variable separable form

Main content:

Problems on Homogeneous differential equations

1) Solve  $(y^2 + 2xy)dx + (2x^2 + 3xy) dy = 0$

2) Solve  $(x - y)dy - (2x - y)dx = 0$

3) Solve  $x \frac{dy}{dx} = y + \sqrt{x^2 + y^2}$

## Session Summary:

To solve first order first degree homogeneous differential equation

$$\frac{dy}{dx} = \frac{f(x,y)}{g(x,y)}$$

- put  $y = vx$  &  $\frac{dy}{dx} = v + x \frac{dv}{dx}$  .
- Solve the resulting DE by method of separation of variables.



MCQ:

1) Solution of  $(x^2 + y^2)dx - 2xydy = 0$

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

B.  $(x^2 - xy) = cx$

C.  $(x^2 - y^2) = cx$

D. None of these

**Ans:** C.  $(x^2 - y^2) = cx$

MCQ :

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

A.  $(y^2 - 2xy + 2x^2) = c$

B.  $(y^2 + 2xy + 2x^2) = c$

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

D. None of these

Ans : A.  $(y^2 - 2xy + 2x^2) = c$

MCQ :

3) Solution of  $(y^2 + 2xy)dx + x + (2x^2 + 3xy)dy = 0$  is

- A.  $xy^2(x - y) = c$
- B.  $xy^2(x + y) = c$
- C.  $x^2y^2(x + y) = c$
- D. None of these

Ans : B.  $xy^2(x + y) = c$

MCQ:

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

A.  $-\frac{y}{x} - \log\left(1 - \frac{y}{x}\right) = \log xc$

B.  $\frac{y}{x} - \log\left(1 - \frac{y}{x}\right) = \log xc$

C.  $-\frac{y}{x} + \log\left(1 - \frac{y}{x}\right) = \log xc$

D. None of these

Ans : A.  $-\frac{y}{x} - \log\left(1 - \frac{y}{x}\right) = \log xc$

MCQ:

5) Solution of  $x \sin\left(\frac{y}{x}\right) dy = \left[ y \sin\left(\frac{y}{x}\right) - x \right] dx = 0$  is

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

B.  $-\cos\frac{y}{x} + \log xy = c$

C.  $-\cos\frac{y}{x} + \log x = c$

D. None of these

**Ans:** C.  $-\cos\frac{y}{x} + \log x = c$

## References:

- Manjunath, B. V. and Nandeeshkumar(2018).  
A textbook of B.Sc Mathematics(First).College book house, Bangalore.
- Raisinghania, M. D.(2014).Ordinary and partial differential equations  
(Sixth). S. Chand,New Delhi.