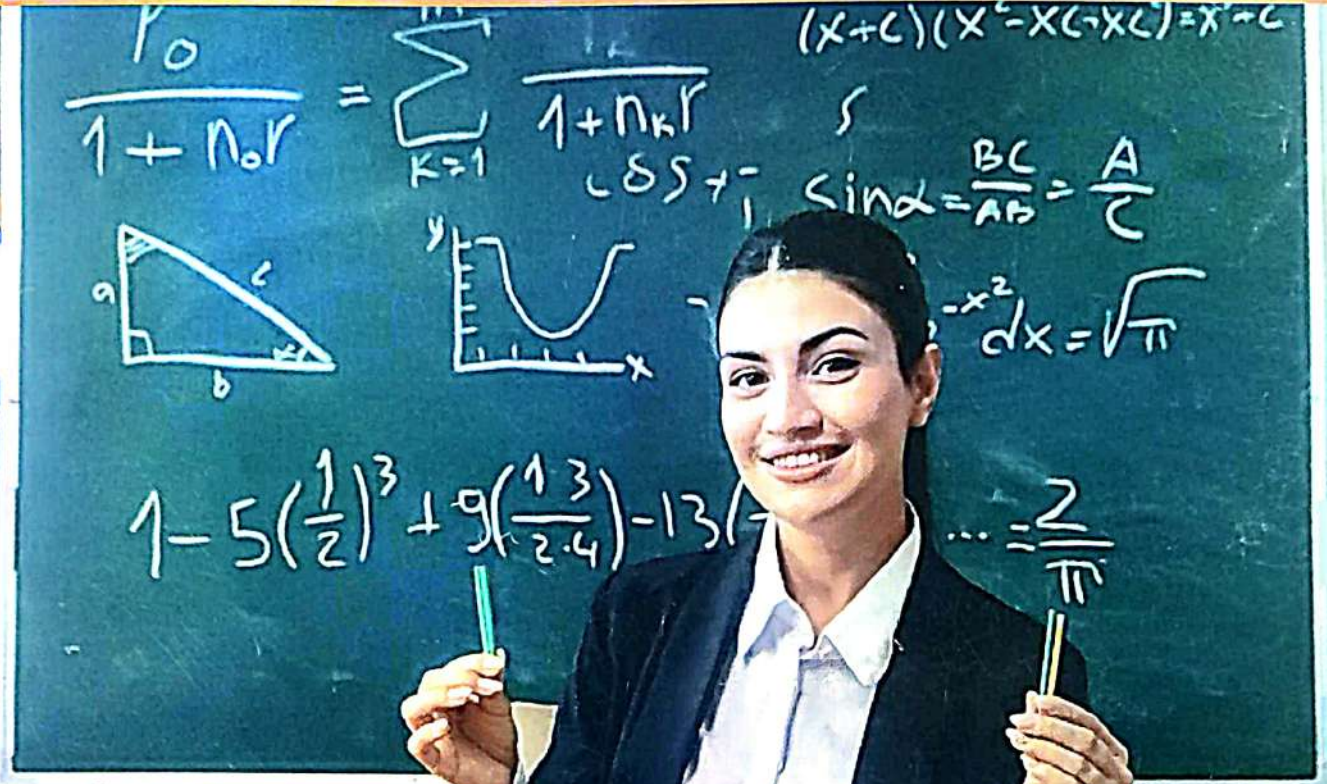


MATHEMATICS

B.Sc., First Year

A.P. Sem - II
(Major)



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Ist Year

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Ist Year

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SEMESTER-II

(COURSE-III)

DIFFERENTIAL EQUATIONS [MAJOR]

Unit-I

1. Differential Equations of first order and first degree:

Linear Differential Equations – Bernoulli's Equations - Exact Differential Equations – Integrating factors - Equations reducible to Exact Equations by Integrating Factors -

- i) Inspection Method ii) $\frac{1}{Mx + Ny}$ iii) $\frac{1}{Mx - Ny}$

Unit-II

2. Differential Equations of first order but not of first degree :

Equations solvable for p , Equations solvable for y , Equations solvable for x – Clairaut's equation - Orthogonal Trajectories: Cartesian and Polar forms.

Unit-III

3. Higher order linear differential equations

Solutions of homogeneous linear differential equations of order n with constant coefficients
- Solutions of non-homogeneous linear differential equations with constant coefficients by means of polynomial operators

- (i) $Q(x) = e^{ax}$ (ii) $Q(x) = \sin ax$ (or) $\cos ax$

Unit-IV

4. Higher order linear differential equations (continued.)

Solution to a non-homogeneous linear differential equation with constant coefficients

P.I. of $f(D)y = Q$ when $Q = bx^k$

P.I. of $f(D)y = Q$ when $Q = e^{ax}V$, where V is a function of x

P.I. of $f(D)y = Q$ when $Q = x^k V$, where V is a function of x

Unit-V

5. Higher order linear differential equations with non-constant coefficients

Linear differential Equations with non-constant coefficients; Cauchy-Euler Equation; Legendre Equation; Method of variation of parameters

**Rayalaseema University, Y.V University, Vikrama Simhapuri University,
Acharya Nagarjuna University, Andhra University, S.K University,
S.V University, Krishna University, Aadikavi Nannaya University,
B.Sc Degree Honours Syllabus, MATHEMATICS, FIRST YEAR [MAJOR]**

SEMESTER-II

(COURSE-IV)

ANALYTICAL SOLID GEOMETRY [MAJOR]

Unit-I

1. The Plane :

Equation of plane in terms of its intercepts on the axis - Equations of the plane through the given points - Length of the perpendicular from a given point to a given plane - Bisectors of angles between two planes - Combined equation of two planes - Orthogonal projection on a plane.

Unit-II

2. The Line :

Equation of a line - Angle between a line and a plane - The condition that a given line may lie in a given plane - The condition that two given lines are coplanar - Number of arbitrary constants in the equations of straight line - Sets of conditions which determine a line - The shortest distance between two lines - The length and equations of the line of shortest distance between two straight lines - Length of the perpendicular from a given point to a given line

Unit-III

3. The Sphere

Definition and equation of the sphere - Equation of the sphere through four given points - Plane sections of a sphere - Intersection of two spheres - Equation of a circle - Sphere through a given circle
- Intersection of a sphere and a line - Power of a point - Tangent plane - Plane of contact
Polar plane
- Pole of a Plane - Conjugate points - Conjugate planes.

Unit-IV

4. Spheres (continued)

Angle of intersection of two spheres - Conditions for two spheres to be orthogonal - Radical plane; Coaxial system of spheres - Simplified form of the equation of two spheres.

Unit-V

5. Cones

Definitions of a cone - vertex, guiding curve and generators - Equation of the cone with given vertex and guiding curve - Equations of cones with vertex at origin are homogeneous - Condition that the general equation of the second degree should represent a cone - Envelope of a cone of a sphere - Right circular cone - Equation of the right circular cone with a given vertex, axis and semi vertical angle.

1111

DIFFERENTIAL EQUATIONS

DIFFERENTIAL EQUATIONS

UNIT-I

DIFFERENTIAL EQUATION OF FIRST ORDER AND FIRST DEGREE

Introduction:-

Differential equation:-

An equation involving independent and dependent variables and the derivatives or differentials of one or more dependent variables with respect to one or more independent variables is called a differential equation.

Examples:-

$$(i) \frac{x d^2 y}{dx^2} + \frac{dy}{dx} xy = 0$$

$$(ii) \frac{dy}{dx} = \sin x + \cos x \quad (iii) y = \sqrt{x} \frac{dy}{dx} + \frac{k}{dy/dx}$$

$$(iv) y = x \frac{dy}{dx} + k \left[\sqrt{1 + \left(\frac{dy}{dx} \right)^2} \right] \quad (v) k \frac{d^2 y}{dx^2} = \left[1 + \left(\frac{dy}{dx} \right)^2 \right]^{\frac{3}{2}}$$

There are two main classes of differential equations:

- 1) Ordinary differential equations,
- 2) Partial differential equations

Ordinary differential equations:-

A differential equation which involves derivatives with respect to a single independent variable is known as an ordinary differential equation.

$$\text{Ex. } \frac{d^2 y}{dx^2} + 5 \frac{dy}{dx} + 6y = 0$$

Partial differential equations:-

A differential equation which contains two or more independent variables and partial derivatives with respect to them is called a partial differential equation.

$$\text{Ex. } \Rightarrow \frac{\partial^2 y}{\partial x^2} + y = 0 \Rightarrow \frac{\partial^2 v}{\partial x^2} + \frac{\partial^2 v}{\partial y^2} + \frac{\partial^2 v}{\partial z^2} = 0$$

Order of differential equations:-

The order of the highest order derivative involved in a differential equation is called the order of the differential equation.

$$\text{Ex. } \frac{x d^2 y}{dx^2} + (2x-1) \frac{dy}{dx} - (x-1)y = e^x$$

∴ The order of differential equation is 2.

Degree of a differential equation:-

The degree of a differential equation is the degree of the highest order derivative present in the equation, after the differential equation has been made free from the radicals and fractions as far as the derivatives are concerned.

An ordinary differential equation of the first order and first degree is of the form.

UNIT-I

ANALYTICAL SOLID GEOMETRY

THE PLANE

Defination:- An equation of the first degree in x, y, z is of the form $ax + by + cz + d = 0$, where a, b, c are given real number and $a^2 + b^2 + c^2 \neq 0$

- * The equation of the plane in interecept form is $\frac{x}{a} + \frac{y}{b} + \frac{z}{c} = 1$ where a, b, c are the intercepts
- * The equation of the plane passing through $(x_1, y_1, z_1), (x_2, y_2, z_2)$ and (x_3, y_3, z_3) is

$$\begin{vmatrix} x-x_1 & y-y_1 & z-z_1 \\ x_2-x_1 & y_2-y_1 & z_2-z_1 \\ x_3-x_1 & y_3-y_1 & z_3-z_1 \end{vmatrix} = 0$$

- * The normal form of the equation $ax + by + cz + d = 0$ is

$$\pm \frac{a}{\sqrt{\sum a^2}} x \pm \frac{b}{\sqrt{\sum a^2}} y \pm \frac{c}{\sqrt{\sum a^2}} z = \pm \frac{d}{\sqrt{\sum a^2}}$$

Where $\sum a^2 = a^2 + b^2 + c^2$

Angle between two planes:-

- * Angle between two planes $a_1x + b_1y + c_1z + d_1 = 0$ and $a_2x + b_2y + c_2z + d_2 = 0$ is

$$\theta = \cos^{-1} \left[\frac{a_1a_2 + b_1b_2 + c_1c_2}{\sqrt{\sum a_1^2} \sqrt{\sum a_2^2}} \right]$$

- * The equation of the plane passing through $(x_1, y_1, z_1), (x_2, y_2, z_2)$ and (x_3, y_3, z_3) is

$$\begin{vmatrix} x-x_1 & y-y_1 & z-z_1 \\ x_2-x_1 & y_2-y_1 & z_2-z_1 \\ x_3-x_1 & y_3-y_1 & z_3-z_1 \end{vmatrix} = 0$$

- * The equation of the plane through the points (x_1, y_1, z_1) and (x_2, y_2, z_2) and perpendicular to the plane $ax + by + cz - d = 0$ is

$$\begin{vmatrix} x-x_1 & y-y_1 & z-z_1 \\ x_2-x_1 & y_2-y_1 & z_2-z_1 \\ a & b & c \end{vmatrix} = 0$$

- * The equation of the plane through (x_1, y_1, z_1) and perpendicular to the planes $a_1x + b_1y + c_1z - d_1 = 0$ and $a_2x + b_2y + c_2z - d_2 = 0$

$$\begin{vmatrix} x-x_1 & y-y_1 & z-z_1 \\ a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \end{vmatrix} = 0$$

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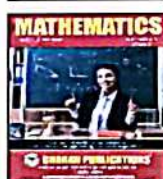
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