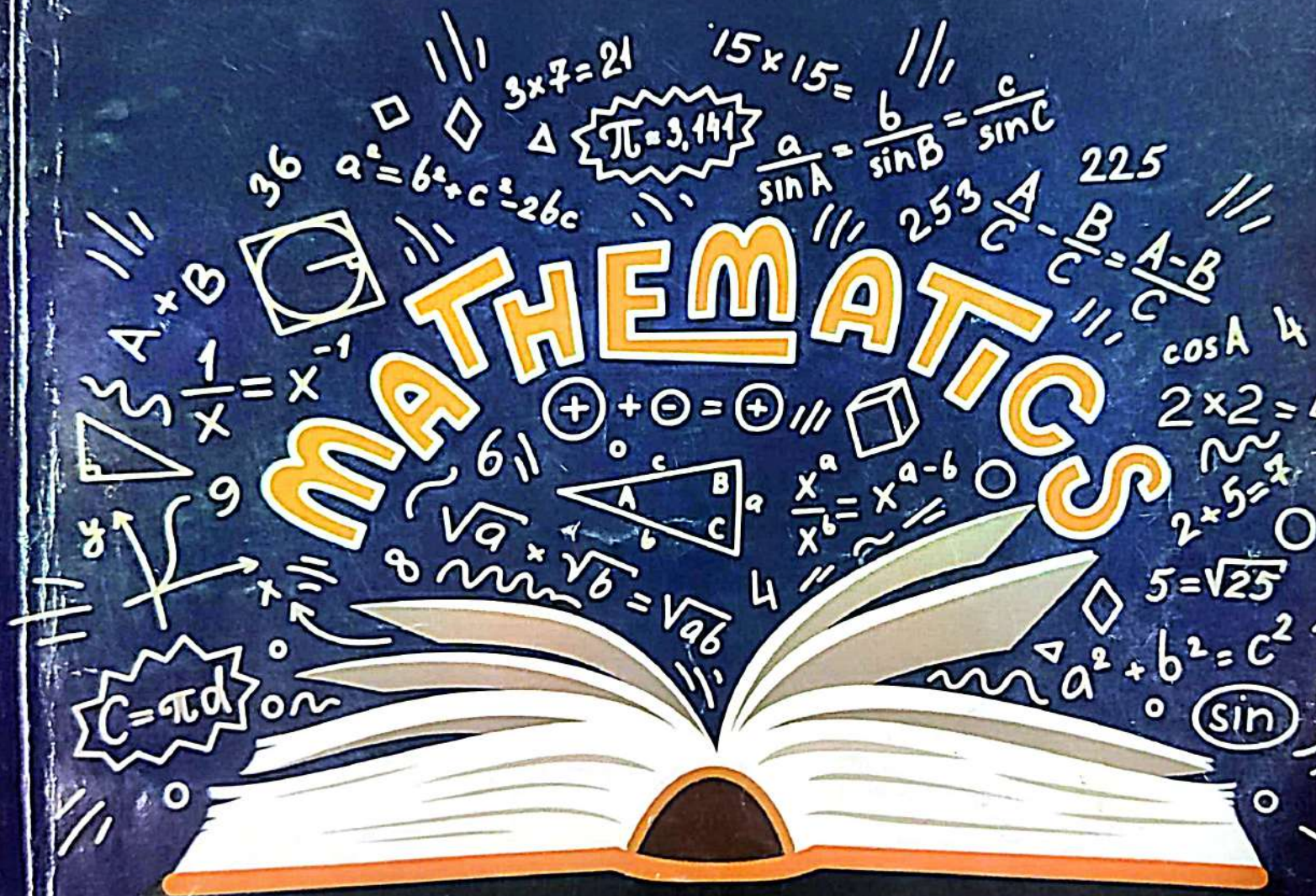


MATHEMATICS

B.Sc., First Year

A.P. Sem - II
(Minor)



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MATHEMATICS

Ist Year



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MATHEMATICS

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Department of Administration

CHINAVIDIUM

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SEMESTER-II

(COURSE-I)

DIFFERENTIAL EQUATIONS [MINOR]

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 $Q = xV$, 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

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 with respect to one or more independent variables is called a differential equation.

Examples:-

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

$$(ii) \frac{dy}{dx} = \sin x + \cos x$$

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

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

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 a 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.

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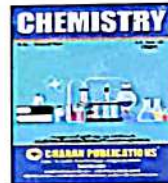
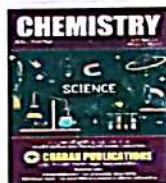
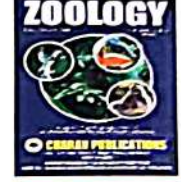
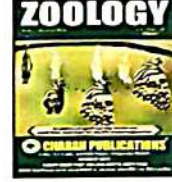
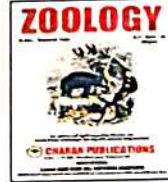
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