Class 11 Mathematics – Chapter: Conic Sections

1. Introduction

- Conic sections are curves obtained by intersecting a plane with a double-napped cone.

- They include circles, ellipses, parabolas, and hyperbolas.

2. Types of Conic Sections

a) Circle

- Set of all points equidistant from a fixed point (center).

- Equation (center at origin):

$$x^2 + y^2 = r^2$$

b) Ellipse

- Set of points where the sum of distances from two fixed points (foci) is constant.

- Standard equation (center at origin):

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$$

- $a > b$ or $b > a$ determines orientation.

c) Parabola

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Set of points equidistant from a fixed point (focus) and a fixed line (directrix).

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Standard equation (vertex at origin):

$$y^2 = 4ax \quad \text{or} \quad x^2 = 4ay$$

d) Hyperbola

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Set of points where the absolute difference of distances from two fixed points (foci) is constant.

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Standard equation (center at origin):

$$\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$$

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3. Important Terms

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Focus (Foci)

- Directrix

- Vertex

- Eccentricity (e): Ratio of distance from focus to directrix; defines shape.

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4. Eccentricity Values

- Circle: $e=0$ $e = 0$ $e=0$

- Ellipse: $0<e<1$ $0 < e < 1$ $0<e<1$

- Parabola: $e=1e = 1e=1$

- Hyperbola: $e>1e > 1e>1$

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5. Applications

- Satellite dishes (parabolas)

- Planetary orbits (ellipses)

- Engineering and physics

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6. Exam Tips

- Memorize standard equations.

- Understand derivations of equations from definitions.

- Practice plotting graphs.

- Solve problems involving distances and eccentricity.