Use rectangular co-ordinates unless otherwise mentioned.

1. Define (a) rectangular co-ordinates; (b) equation of a line; (c) ellipse; (d) parabola.
2. Construct and discuss the equation \( x^2 + y^2 = 16 \).
3. Prove that \( \frac{x}{a} + \frac{y}{b} = 1 \) is the equation of a right line, \( a \) and \( b \) being the distances from the origin at which it intersects the two axes.
4. Prove that the formulas for passing from a rectangular to a polar system of co-ordinates, when the polar axis is parallel to the axis of \( x \), are \( x = m + r \cos A \), and \( y = n + r \sin A \).
5. Prove that the polar equation of the circle is \( r^2 - 2rr' \cos (A-B) + r'^2 - R^2 = 0 \), in which \( R \) is the radius of the circle, and \( r' \) and \( B \) the co-ordinates of any point \( P \).
6. Prove that the equation of the parabola, referred to its axis and tangent at the principal vertex, is \( y^2 = 2px \), \( p \) representing the distance from the focus to the directrix.
7. Find the points of intersection of the parabola \( y^2 = 8x \) and the line \( 3y - 2x - 8 = 0 \).
8. Find the equation of a tangent to the ellipse \( 3y^2 + 2x^2 = 35 \) at the point whose abscissa is 2.
9. Find the eccentricity of the ellipse \( 2x^2 + 3y^2 = 2 \).
10. Find the transverse and conjugate axes of the hyperbola whose equation is \( 3y^2 - 2x^2 + 12 = 0 \); find also the parameter.