

Each equation below is the equation of one of the conic sections we've studied: Circle, Parabola, Ellipse, Hyperbola. Use the method of completing the square to get each equation into the standard form for the conic section to identify the curve associated with the equation. For each conic find the value of the eccentricity e , then if it's a:

- Circle, identify the coordinates of the center and the radius then graph the circle, clearly indicating these features on the graph.
- Parabola, identify the coordinates of the vertex, the coordinates of the focus and the equation of the directrix, then graph the parabola, clearly indicating these features on the graph. Your graph should pass through three points on the parabola, labelled with their coordinates.
- Ellipse, identify the coordinates of the center, the coordinates of the foci, the coordinates of the vertices (endpoints of the major axis) and the coordinates of the endpoints of the minor axes, then graph the ellipse, clearly indicating these features on the graph.
- Hyperbola, identify the coordinates of the center, the coordinates of the foci, the coordinates of the vertices (endpoints of the transverse axis) and the equations of the asymptotes, then graph the hyperbola, clearly indicating these features on the graph.

1. $4x^2 - 16y^2 - 64y - 48 = 0$

2. $y^2 - 6y - 8x - 23 = 0$

3. $2x^2 + 2y^2 - 12x + 16y = 0$

4. $9x^2 + 4y^2 - 36x + 24y + 36 = 0$

Each graph should be done on graph paper with the axes scaled so that each graph is large and occupies one sheet. Neatness and accuracy of the graphed features is important.