Chapter 7: Conic Sections

Topics: Parabolas, Ellipses, Circles & Hyperbolas. Be able to identify all key parts of each conic, vertex, focus, directrix, axis of symmetry, center, foci, vertices, co-vertices, major axis, minor axis, transverse axis, conjugate axis, eccentricity, equation for asymptotes. Be able to put a conic into standard form by completing the square, find equations for conics given basic pieces of the conic, and identify equations of conic from a graph.

1.   Find the equation of the parabola with the given characteristics.

   a. focus (2,1) and vertex (-5,1)

   b. directrix at $y = -1$, focus at $(3,-5)$

   c. directrix at $x = -1$, vertex at $(-5,1)$

2.   Put the conic in standard form and identify all key parts, then graph.

   a. $3y^2 + 6y + 15 = 12x$

   b. $8y = -4x^2 - 24x - 12$

3.   The cross section of a satellite television dish has a parabolic shape that focuses the satellite signals onto a receiver located at the focus of the parabola. If the ground represents the directrix ($y = 0$) and the vertex is located 4 feet off the ground. Where is the receiver located?

4.   Find the equation of the ellipse with the given characteristics.
   a. Major axis from $(6,-2)$ to $(-2,-2)$, minor axis from $(2,0)$ to $(2,-4)$
   b. Vertices at $(-2,-4)$ and $(-2,8)$ and length of minor axis is 10.
   c. Foci at $(-6,9)$ and $(-6,-3)$ and length of major axis is 20.
   d. Vertices at $(4,3)$ and $(4,-9)$ and co-vertices at $(2,-3)$ and $(6,-3)$

5.   Find the equation of the circle with the given characteristics.

   a. Radius of 15, centered at $(6,8)$

   b. Diameter of 22, centered at $(-2,7)$

6.   Put the conic in standard form and identify all key parts, then graph.

   a. $3x^2 + y^2 - 42x + 4y + 142 = 0$

   b. $5x^2 + 2y^2 + 30x - 16y + 27 = 0$

   c. $x^2 + y^2 - 8x - 6y - 39 = 0$

7.   A carpenter has been hired to construct a sign for the local thrift shop. It is to be elliptical in shape and the width should be 48 cm and the height should be 30 cm. Find an equation for this sign if the center of the sign is located at the origin.

8. Find the equation of the hyperbola with the given characteristics

   a. Foci at $(1,-5)$ and $(1,1)$; transverse axis length 4

   b. Vertices at $(-3,-12),(-3,-4)$; foci at $(-3,-15),(-3,-1)$

   c. Vertices at $(0,3),(-4,3)$;conjugate axis length of 12 units.

9. Put the conic in standard form and identify all key parts, then graph.

   $-x^2 +3y^2 -4x+6y = 28$

10. Determine the eccentricity of

    a. $3x^2 -2y^2 +12x-12y = 42$

    b. $\dfrac{(y+3)^2}{32} - \dfrac{(x-1)^2}{25} = 1$

    c. $\dfrac{(x-7)^2}{64} + \dfrac{(y-1)^2}{36} = 1$

11. Use the discriminant to identify the conic

    a. $2x^2 + y^2 -24x+5xy-13=0$

    b. $4x^2 + y^2 -2y+4xy+12=0$

    c. $3x^2 +13x+3y^2 -2y=0$