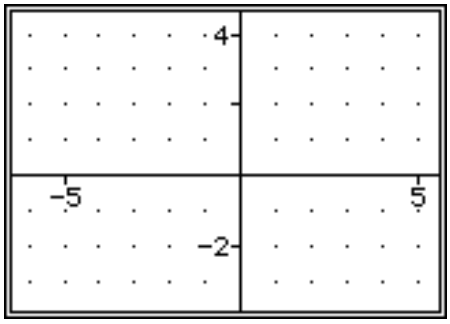
Exploring Rectangular and Parametric Forms of an Ellipse

1. a) Graph: x=3cos(t), y=2sin(t) and indicate the orientation of the curve using arrows.



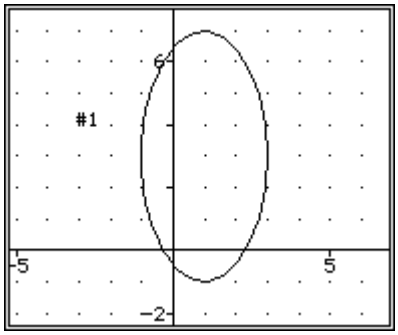
b) Rewrite the parametric equations in implicit form. If the right side of the equation does not equal 1, divide both sides of the equation by whatever it takes to make the right side 1.

c) What is the **horizontal** distance from the center to a point on the edge? Where is this number located in the equation found in part b?

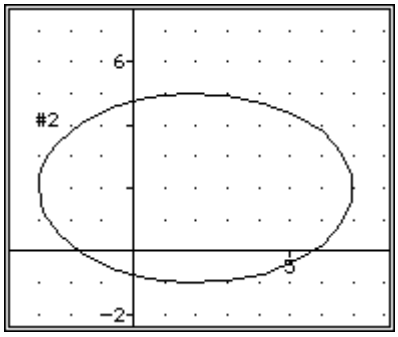
d) What is the **vertical** distance from the center to a point on the edge? Where is this number located in the equation found in part b?

2. Match each set of parametric equations to their graph and then rewrite each as an implicit equation with the right side equal to 1.
   *__Also__, sketch and label the horizonal and vertical distance from the center of each ellipse to the edge on the given graphs AND use arrows to indicate the orientation.

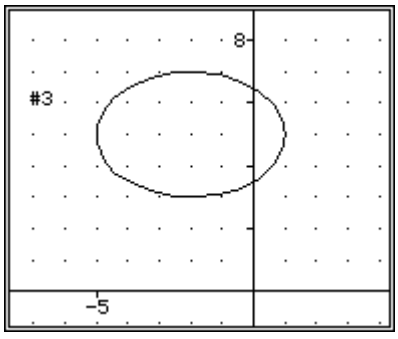
   a) x=1+2cos(t)
      y=3+4sin(t)
      Matches:____
      Implicit Form:_____



   b) x=-2+3cos(t)
      y=5-2sin(t)
      Matches:____
      Implicit Form:_____



   c) x=2-5cos(t)
      y=2+3sin(t)
      Matches:____
      Implicit Form:_____



The parametric form of an ellipse is given by:

$x = h + a\cos(t)$ *and* $y = k + b\sin(t)$ *for* $0 \le t < 2\pi$

where (h,k)=center, a is the horizontal distance from the center to the edge and b is the vertical distance from the center to the edge. The signs *following* h and k control the *orientation* of the ellipse.

The implicit form of an ellipse in standard form is given by:

$\frac{(x-h)^2}{a^2} + \frac{(y-k)^2}{b^2} = 1$ where (h,k)=center, a is the horizontal distance from the center to the edge and b is the vertical distance from the center to the edge.

NOTE: The "diameters" of an ellipse are **2a** and **2b**. The longer of the two distances is called the **major axis** and the shorter is called in **minor axis**.

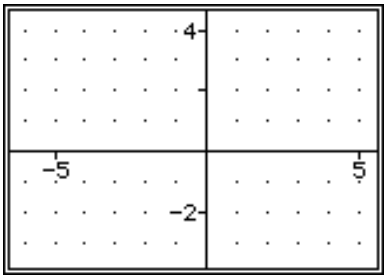
3. a) Graph: x=1+3cos(t), y=3-sin(t) and indicate the orientation of the curve using arrows.

Complete:

Center=_____

a=____

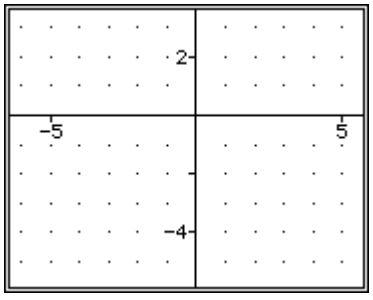
b=____



b) Graph: $9x^2 + 4y^2 + 36x + 8y + 4 = 0$

To start: $9x^2 + 4y^2 + 36x + 8y = -4$

Next: $9(x^2 + 4x + \_\_\ ) + 4(y^2 + 2y + \_\_\ ) = -4 + \_\_ + \_\_$



Check your answer!!!

Any point on the graph (edge) should satisfy the original equation.