

## Exploring Rectangular and Parametric Forms of a Circle and More

The implicit form of a circle in standard form is given by:

$$(x-h)^2 + (y-k)^2 = r^2 \quad \text{where } (h, k) = \text{center} \quad \text{and} \quad r = \text{radius}$$

1. Graph the following circles on the same grid:

a)  $(x-2)^2 + (y-1)^2 = 4$

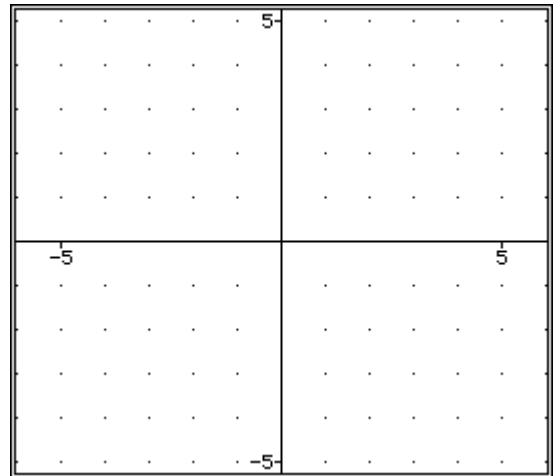
Center: \_\_\_\_\_

Radius: \_\_\_\_\_

b)  $(x+2)^2 + y^2 = 9$

Center: \_\_\_\_\_

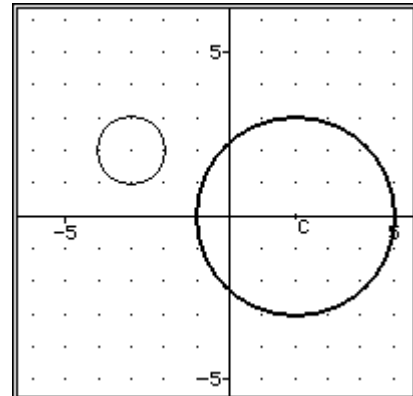
Radius: \_\_\_\_\_



2. Rewrite the following equations in standard form and identify their graph.

a)  $x^2 + y^2 - 4x - 5 = 0$

b)  $x^2 + y^2 + 6x - 4y + 12 = 0$



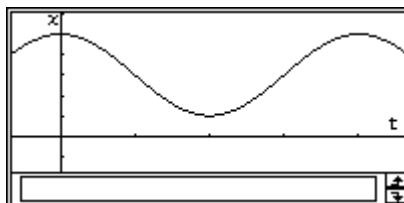
## Parametric Equations...

- On the right are two graphs. One is  $x=3+2\cos(t)$  and the other is  $y=5+2\sin(t)$ . Complete the following information and then add values to the t-axis, draw the midline and identify the amplitude visually.

**Complete:** Which Eqn? \_\_\_\_\_

Midline=\_\_\_\_\_

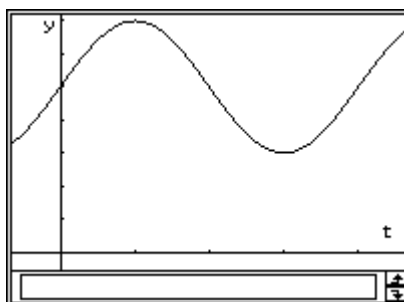
Amplitude=\_\_\_\_\_



**Complete:** Which Eqn? \_\_\_\_\_

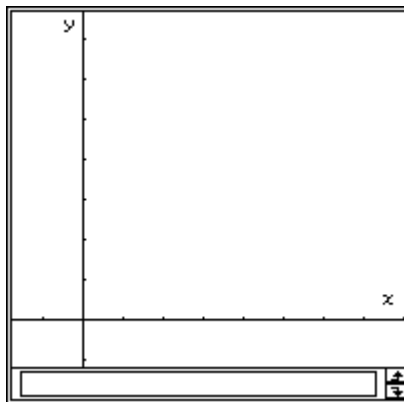
Midline=\_\_\_\_\_

Amplitude=\_\_\_\_\_



- Sketch the graph of the parametric equation given above on the x-y axis for  $0 \leq t < 2\pi$ .

t	$x=3+2\cos(t)$	$y=5+2\sin(t)$	(x,y)
0			
$\pi/4$			
$\pi/2$			
$3\pi/4$			
$\pi$			
$5\pi/4$			
$3\pi/2$			
$7\pi/4$			
$2\pi$			



**Complete:** Center = \_\_\_\_\_, Radius = \_\_\_\_\_

Can you see the center and radius in the initial equations?  $x=3+2\cos(t)$ ,  $y=5+2\sin(t)$

The parametric form of a circle is given by:

$$x = h + r \cos(t) \text{ and } y = k + r \sin(t) \quad \text{where } (h, k) = \text{center and } r = \text{radius}$$

The implicit form of a circle in standard form is given by:

$$(x - h)^2 + (y - k)^2 = r^2 \quad \text{where } (h, k) = \text{center and } r = \text{radius}$$

3. Find the equation of the circle given the graph:

a) Center= \_\_\_\_\_, Radius= \_\_\_\_\_

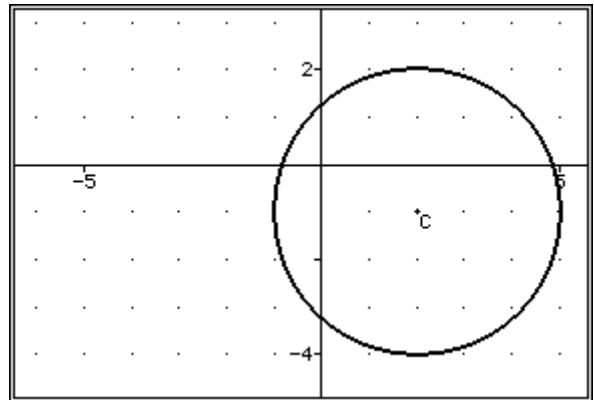
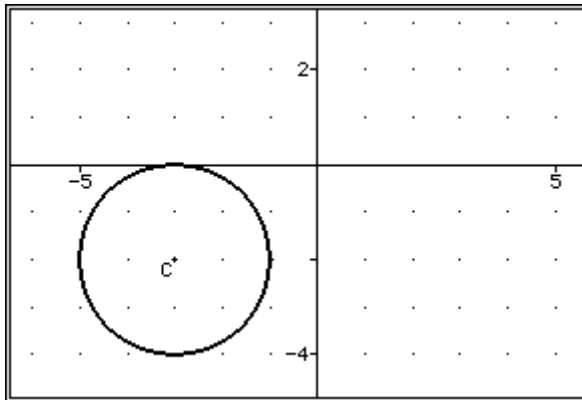
b) Center: \_\_\_\_\_, Radius= \_\_\_\_\_

Implicit Equation:

Implicit Equation:

Parametric Equations:

Parametric Equations:



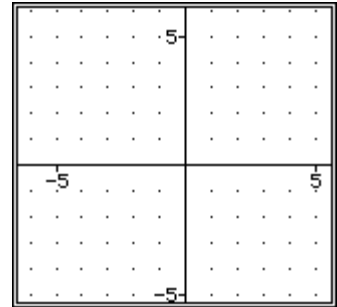
4. Rewrite as an implicit equation in terms of  $x$  and  $y$ . Identify the center and radius of the circle:

$$x = 3 + 4 \sin(t), \quad y = 2 + 4 \cos(t)$$

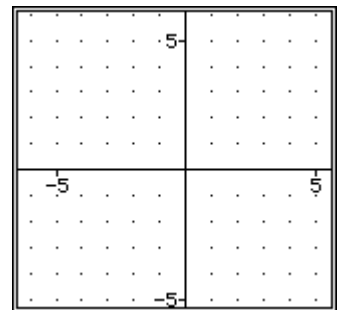
5. Solve your result in question 4 for  $y$ .

6. Parameterize each circle described below:

a) Radius of 2, center (1, 2), clockwise starting at (1,4).



b) Radius of 3, center (0,-1), counterclockwise starting at (-3,-1).



7. Rewrite the following parametric equations as implicit or explicit equations:

a)  $x=1+\cos(t)$ ,  $y=2-\cos(t)$

b)  $x=t-3$ ,  $y=\sin(t)+\cos(2t)$

8. Rewrite the following implicit equation as a parametric equations:

[HINT: Start by letting  $x=t$ ]

$$x^2y = 5$$