

Let's come up with the equation of a circle. Use the picture to the right and the Geogebra model I will use to answer the following questions.

1. How are the lengths of any right triangle related?

$$a^2 + b^2 = c^2$$

2. Which coordinate (x or y) represents the length labeled a and b?

$$x = a \quad y = b$$

3. How long are a and b?

~~$$a = 3 \quad b = 4$$~~

4. If I think of point B as the center of the circle and swing point A around, what does c represent in terms of the circle?

$$c = \text{radius}$$

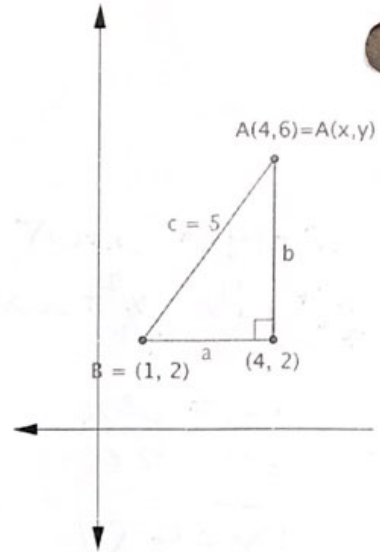
5. Use the information from part 2-4 and replace it into the Pythagorean theorem. That is the equation of a circle!

$$(x-h)^2 + (y-k)^2 = r^2$$

$$x^2 + y^2 = r^2$$

How would I write the equation of a circle? What pieces of information do need?

radius. center of circle.



**Examples:** Use the information provided to write the equation of each circle

4. Center: (0,0) and Radius 3

$$x^2 + y^2 = 9$$

5. Center: (3,4) and circumference of  $8\pi$

$$(x-3)^2 + (y-4)^2 = 16$$

6. Center: (3, -2) and a point on the circle (6,2)

$$(x-3)^2 + (y+2)^2 = 25$$

7. Center: (1,2) and tangent to  $x = 4$

$$C = 2\pi r = 8\pi$$

$$r = 4$$

$$(x-1)^2 + (y-2)^2 = 3^2$$

$$(x-1)^2 + (y-2)^2 = 9$$

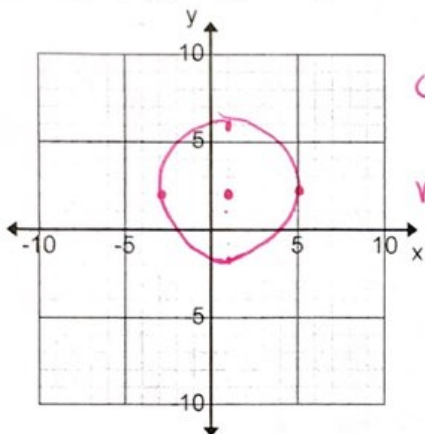
distance formula:  $\sqrt{(x_2-x_1)^2 + (y_2-y_1)^2}$

$$\sqrt{(6-3)^2 + (2-(-2))^2} = \sqrt{25} = 5$$

## How would I graph a circle given its equation?

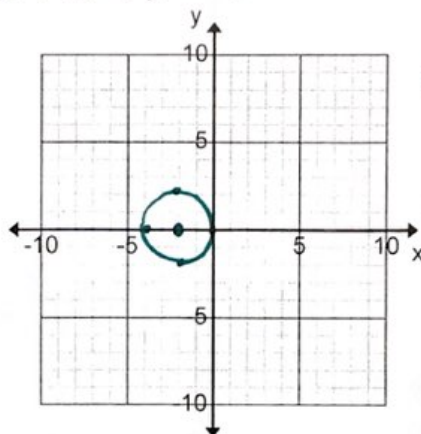
**Examples:** Identify the center and radius of each. Then sketch the graph.

1.  $(x - 1)^2 + (y - 2)^2 = 16$



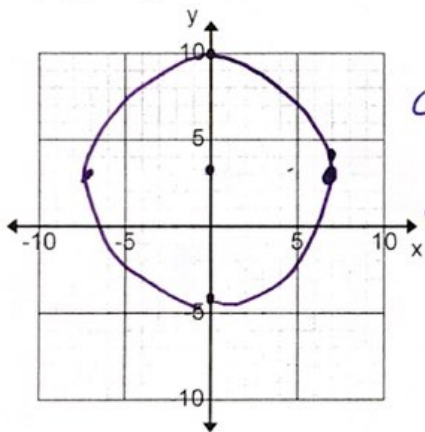
center:  
(1, 2)  
radius:  
4

2.  $(x + 2)^2 + y^2 = 4$



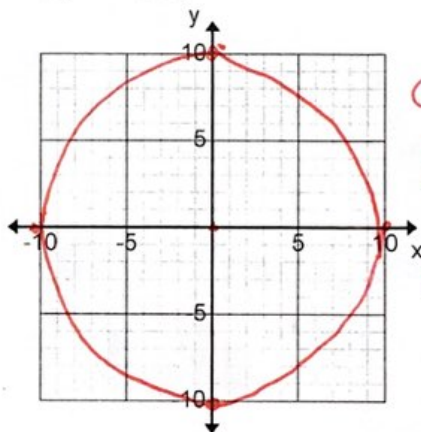
center:  
(-2, 0)  
radius:  
2

3.  $x^2 + (y - 3)^2 = 49$



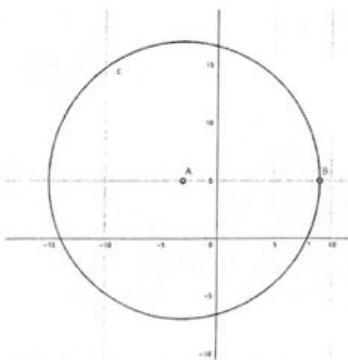
center:  
(0, 3)  
radius: 7

4.  $x^2 + y^2 = 100$



center:  
(0, 0)  
radius: 10

5. **Extended Understanding:** A particular cell phone tower is designed to service a 12-mile radius. The tower is located at  $(-3, 5)$  on a coordinate plane whose units represent miles.
- What is the standard equation of the outer boundary of the region serviced by the tower?
  - Is a cell phone user at  $(8, 0)$  within the service range? Explain.



a)  $(x + 3)^2 + (y - 5)^2 = 144$

b) NO. Plug in 8 for x, 0 for y.  $146 \neq 144$ . It is on the very outer edge, but it's in range.