

Objectives:

- Students will understand how to derive the equation of a circle.
- Students will be able to write an equation of a circle and graph a circle.

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 is for a y is for b.

3. How long are a and b?

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

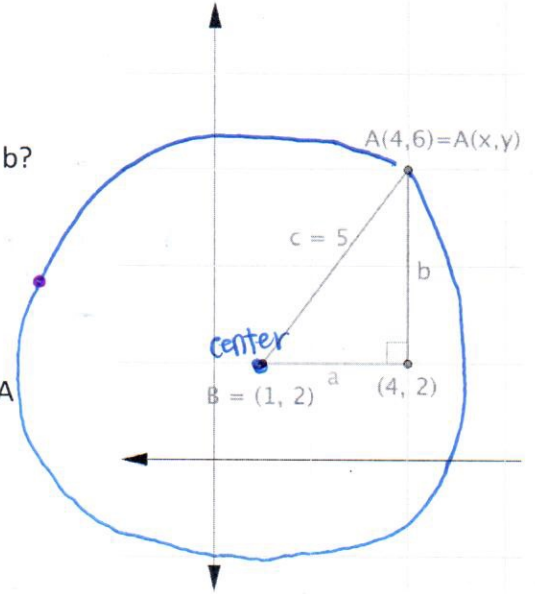
$$(4 - 1) = 3 \quad 6 - 2 = 4$$

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 = radius

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

$$a^2 + b^2 = c^2 \implies (x - h)^2 + (y - k)^2 = r^2$$



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

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

center (h, k), radius, r

Example Set 1: Use the information provided to write the equation of each circle

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

h k r = 3

$$(x - 0)^2 + (y - 0)^2 = 3^2$$

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

2. Center: (4,5) and Radius $\sqrt{5}$

h k r = $\sqrt{5}$

$$(x - 4)^2 + (y - 5)^2 = (\sqrt{5})^2$$

$$(x - 4)^2 + (y - 5)^2 = 5$$

3. Center: (3,4) and circumference of 8π

h k

$$\frac{2\pi r}{2\pi} = \frac{8\pi}{2\pi}$$

$$r = 4$$

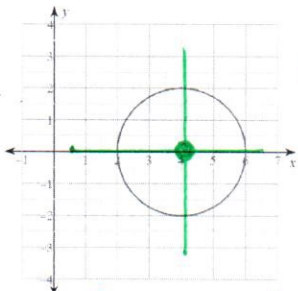
$$(x - 3)^2 + (y - 4)^2 = 16$$

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

h k r = 3

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

5.

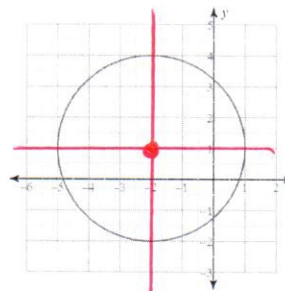


center
(4, 0)
r = 2

$$(x - 4)^2 + (y - 0)^2 = 2^2$$

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

6.



center
(-2, 1)
r = 3

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

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

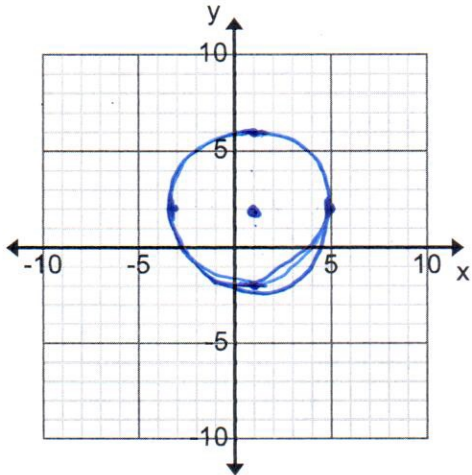
How would I graph a circle given its equation?

Example Set 2: Identify the center and radius of each. Then sketch the graph.

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

center
(1, 2)

$$\sqrt{r^2} = \sqrt{16}$$
$$r = 4$$

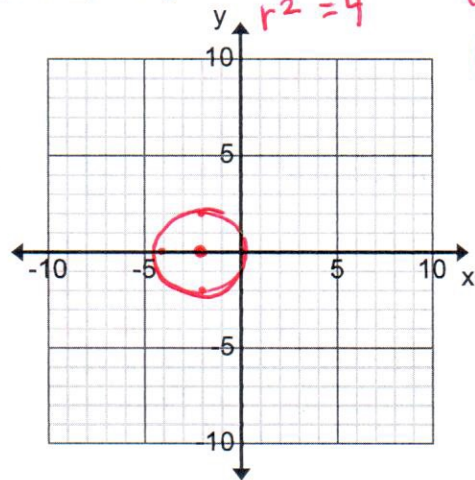


2. $(x + 2)^2 + y^2 = 4$

$$r^2 = 4$$

center
(-2, 0)

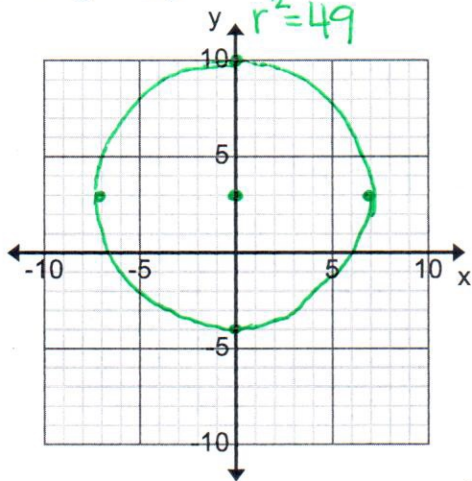
$$r = 2$$



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

center
(0, 3)

$$r = 7$$



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

