

## Class Notes 1: Circles in the Coordinate Plane

## Warm-up

Remember the distance formula?

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

Use the distance formula to find the distance, to the nearest tenth, between each pair of points.

Simp. rad. form

1) A(6, 1) and D(-3, -2)

$$= \sqrt{(6 - (-3))^2 + (1 - (-2))^2}$$

$$= \sqrt{(9)^2 + (3)^2}$$

$$= \sqrt{81 + 9}$$

$$= \sqrt{90}$$

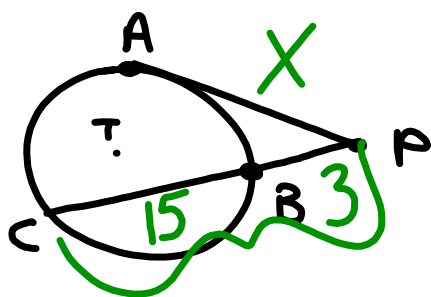
$$= \sqrt{9} \sqrt{10}$$

$$= 3\sqrt{10}$$

$$\text{or } 9.5$$

DO:

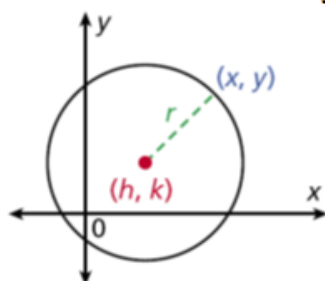
Aug 2017  
# 12 (part of Review #2  
due tomorrow)



$$\begin{aligned}X^2 &= 3(18) \\ \sqrt{X^2} &= \sqrt{54} \\ &= \sqrt{9} \sqrt{6} \\ &= 3\sqrt{6}\end{aligned}$$

$$y - y_1 = m(x - x_1)$$

The \_\_\_\_\_ of a circle is based on the \_\_\_\_\_  
 \_\_\_\_\_ and the fact that all points on a circle are  
 equidistant from the center. Find the length of radius  $r$ .



$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$r = \sqrt{(x - h)^2 + (y - k)^2}$$

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

The equation of a circle in Standard Form with center (h, k) and  
 radius r is:

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

### The Equation of a Circle in Standard Form (Center-Radius Form)

~~(0,0)~~

Ex 1: The graph of each of the following is a circle whose center is at the origin. State the radius of each circle in simplest form.

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

a.  $x^2 + y^2 = \sqrt{100}$

$r = \underline{\underline{10}}$

b.  $x^2 + y^2 = \sqrt{1}$

$r = \underline{\underline{1}}$

c.  $x^2 + y^2 = \sqrt{5}$

$r = \underline{\underline{\sqrt{5}}}$

d.  $x^2 + y^2 = \sqrt{18}$

$\sqrt{9} \sqrt{2}$

$r = \underline{\underline{3\sqrt{2}}}$

Ex 2: Find the radius and the center of each circle.

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

$(h, k)$  has opp. signs

a.  $(x - 6)^2 + y^2 = 25$

Radius

5

Center

(6, 0)

b.  $x^2 + (y + 2)^2 = 49$

7

(0, -2)

c.  $(x + 13)^2 + (y + 5)^2 = 81$

9

(-13, -5)

Ex 3: Write an equation of the circle with the following centers/radii:

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

a. C(0, 5), r = 6

h k

$$(x-0)^2 + (y-5)^2 = 6^2$$

$$x^2 + (y-5)^2 = 36$$

b. C(-3, 4), r =  $\sqrt{5}$

$$(x+3)^2 + (y-4)^2 = 5$$

Ex 4: Write the equation of the circle with center at the origin and radius of 4.5.

$$x^2 + y^2 = 20.25$$

$$r^2 = (\sqrt{5})^2$$

$$r^2 = 5$$

Ex 5: Write the equation of the circle with center  $(4, -1)$  that passes through  $(5, 2)$

①  $(x-h)^2 + (y-k)^2 = r^2$  <sup>h k</sup>  
 ①  $(h, k) \rightarrow (4, -1)$   $(x-4)^2 + (y+1)^2 = 10$   $(4, -1)$   $(5, 2)$   
 ② radius  $\rightarrow \sqrt{(5-4)^2 + (2-(-1))^2} = \sqrt{1^2 + 3^2} = \sqrt{10} = r$

Review: Midpoint Formula:  $\left( \frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$   
 Average

Ex 6:

Write the equation of the circle whose diameter has endpoints  $(4, -3)$  and  $(-2, 5)$ .

①  $(h, k) = \left( \frac{4 + (-2)}{2}, \frac{-3 + 5}{2} \right) = (1, 1)$

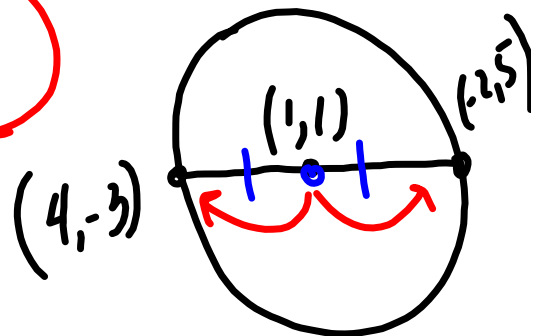
② radius

$$= \sqrt{(4-1)^2 + (-3-1)^2}$$

$$= \sqrt{3^2 + (-4)^2}$$

$$= \sqrt{9+16} = \sqrt{25} = 5 = r$$

③  $(x-1)^2 + (y-1)^2 = 25$



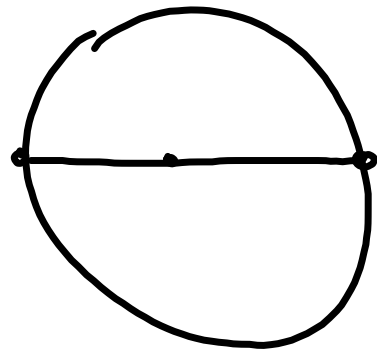
Ex 7:

Write the equation of the circle whose diameter has endpoints  $(4, -1)$  and  $(-6, 7)$ .

$$\begin{aligned} \textcircled{1} \quad & \left( \frac{4+(-6)}{2}, \frac{-1+7}{2} \right) \\ & = (-1, 3) = (h, k) \end{aligned}$$

$$\textcircled{2} \quad \sqrt{41} = r$$

$$\textcircled{3} \quad \boxed{(x+1)^2 + (y-3)^2 = 41}$$





**TRY IT!!**

Write the equation of each circle.

1)  $\odot P$  with center  $P(0, -3)$  and radius 8

2)  $\odot Q$  that passes through  $(2, 3)$  and has center  $Q(2, -1)$

## Graphing a Circle

### Student to Student

#### Graphing Circles



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*I found a way to use my calculator to graph circles. You first need to write the circle's equation in  $y =$  form.*

*For example, to graph  $x^2 + y^2 = 16$ , first solve for  $y$ .*

$$y^2 = 16 - x^2$$

$$y = \pm\sqrt{16 - x^2}$$

*Now enter and graph the two equations*

$$y_1 = \sqrt{16 - x^2} \text{ and } y_2 = -\sqrt{16 - x^2}.$$

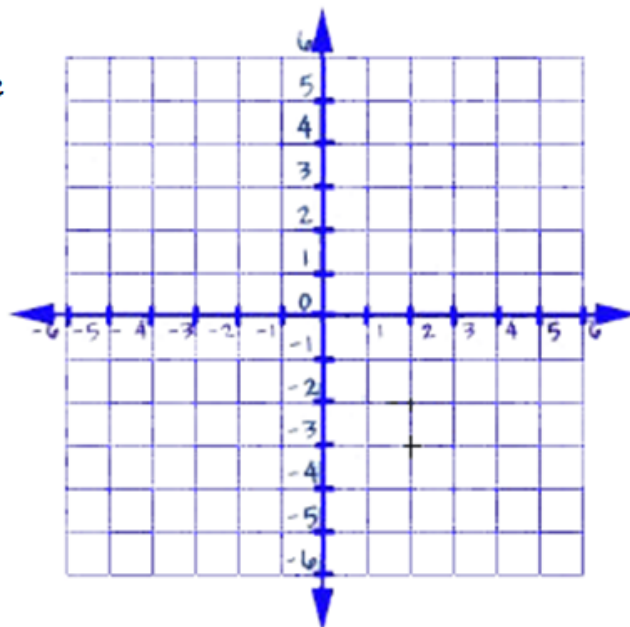


**\* Must use zoom 6 then zoom 5 to graph correctly!**

**A**  $x^2 + y^2 = 25$

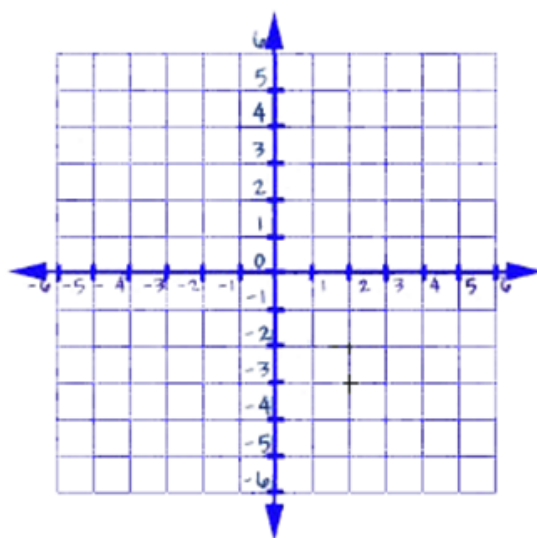
Step 1: Find the center and radius

Step 2: Graph the circle



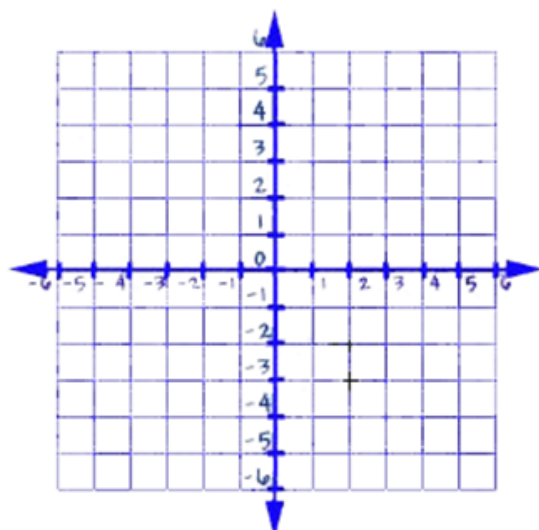
Geometry  
Unit 12: Circles

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



**TRY IT!!**

**A.**  $x^2 + y^2 = 16$



**B.**  $(x - 3)^2 + (y + 4)^2 = 4$

