

Chapter 2.4 Notes  
Circles

Standard form of an equation of a circle:

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

$r$  = radius

center =  $(h, k)$

General form of the equation of a circle

$$x^2 + y^2 + ax + by + c = 0$$

Standard form of equation of circle with radius  $r$  and center at  $(0,0)$  is

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

When graphing a circle, remember standard form is

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

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

Take the  
opposite

$(-3, 2)$

Center

Take the  
square root  
of the number

4  
radius

1. Write the standard form of the equation and the general form of the equation of the circle with radius  $r$  and center  $(h,k)$ . Then graph the circle.

$$r = 5 \quad (h,k) = (-3,4)$$

$\uparrow$   $\uparrow$   
 $h$   $k$

### Standard form

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

2 negatives beside each other make a (+)

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

$$(x + 3)^2 + (y - 4)^2 = 25$$

- \* First we want to get the the the numbers we have into standard form.
- \* Replace the  $h$ ,  $k$  and  $r$  with your numbers.
- \* Make sure and square the last number. This will be standard form.

\* replace  $h, k,$  and  $r$  with your numbers.

### General Form :

$$(x+3)^2 + (y-4)^2 = 25$$

$$(x+3)(x+3) + (y-4)(y-4) = 25$$

$$x^2 + 3x + 3x + 9 + y^2 - 4y - 4y + 16 = 25$$

$$x^2 + 6x + 9 + y^2 - 8y + 16 = 25$$

$$x^2 + 6x + y^2 - 8y + 25 = 25$$

$$x^2 + 6x + y^2 - 8y = 0$$

- \* we want to rewrite our equation into the general form.
- \* First, write down your standard form equation.
- \* Then you will write down the expression in the 1st set of  $()$  twice, followed by a  $+$  sign, followed by the expression in the 2nd set of  $()$  written down twice.
- \* Then we combine like terms on the left side of the equal sign.
- \* Then we move the number on the left side to the right side by doing the opposite.
- \* Then make sure to arrange the equation in the same way as the general form.

### General form equation

$$x^2 + y^2 + ax + by + c = 0$$

$$x^2 + y^2 + 6x - 8y = 0$$

2. Write the standard form of the equation and the general form of the equation of the circle with radius  $r$  and center  $(h,k)$ . Then graph the circle.

$$r = 1 \quad (h, k) = (-4, -3)$$

Standard Form:

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

$$(x-(-4))^2 + (y-(-3))^2 = 1^2$$

$$(x+4)^2 + (y+3)^2 = 1$$

2 negatives beside each other makes a (+)

Just replace  $h, k, r$  with your numbers.

square this number

- \* First we want to get the the the numbers we have into standard form.
- \* Replace the  $h, k$  and  $r$  with your numbers.
- \* Make sure and square the last number. This will be standard form.

General Form

$$(x+4)^2 + (y+3)^2 = 1$$

$$(x+4)(x+4) + (y+3)(y+3) = 1$$

$$x^2 + 4x + 4x + 16 + y^2 + 3y + 3y + 9 = 1$$

$$x^2 + 8x + 16 + y^2 + 6y + 9 = 1$$

$$x^2 + 8x + y^2 + 6y + 25 = 1$$

Combine like terms

- \* we want to rewrite our equation into the general form.
- \* First, write down your standard form equation.
- \* Then you will write down the expression in the 1st set of  $()$  twice, followed by a  $+$  sign, followed by the expression in the 2nd set of  $()$  written down twice.
- \* Then we combine like terms on the left side of the equal sign.
- \* Then we move the number on the left side to the right side by doing the opposite.
- \* Then make sure to arrange the equation in the same way as the general form.

$$x^2 + 8x + y^2 + 6y + 24 = 0$$

← Rearrange into General form

$$x^2 + y^2 + 8x + 6y + 24 = 0$$

General form equation

$$x^2 + y^2 + ax + by + c = 0$$

3. For the equation  $x^2 + y^2 - 4x - 6y - 3 = 0$ , do the following.
- Find the center (h,k) and radius of the circle
  - Graph the circle
  - Find the intercepts, if any.

Rearrange so that the x's are together & the y's are together.

$$x^2 + y^2 - 4x - 6y - 3 = 0$$

$$x^2 - 4x + y^2 - 6y - 3 = 0$$

← move number to right side.

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$$x^2 - 4x + y^2 - 6y = 3$$

bring down # in front of x

bring down # in front of y

divide it by 2

$$\frac{-4}{2} = -2$$

Take the opposite

(divide it by 2)

$$\frac{-6}{2} = -3$$

Take the opposite

This is the center

(2, 3)

Take the two #'s from the center & square them

Radius

$$3 + 3^2 + 2^2 =$$

$$16$$

$$\sqrt{16} =$$

4

radius

- Radius:
- \* write down the # that was on the right side of the equation.
  - \* Then add to that the two #'s you got for the center, but square each one.
  - \* Add the #'s together.
  - \* Then take the square root.
  - \* This number will be the radius.

To Graph:

- ① Press the  $\odot$  button in right hand corner.
- ② Graph the center point first
- ③ move out from the center the # of places the radius says and make 2<sup>nd</sup> point.

4. A circle has the equation  $x^2 + y^2 + 2x - 6y - 6 = 0$
- Finished the center  $(h,k)$  and radius  $r$  of the circle.
  - Graph the circle
  - Find the intercepts, if any, of the graph.

$$x^2 + y^2 + 2x - 6y - 6 = 0$$

$$x^2 + 2x + y^2 - 6y - 6 = 0$$

$$x^2 + 2x + y^2 - 6y = 6$$

Rearrange so that the  $x$ 's are together and the  $y$ 's are together  
 ← move number to right side

Write down # in front of  $x$   
 (divide by 2)

Write down # in front of  $y$ , then  $\div$  it by 2

$$\frac{-6}{2} = -3$$

write down opposite

write down opposite

center

$$(-1, 3)$$

Radius

$$6 + (-1)^2 + 3^2 =$$

$$16 =$$

$$\sqrt{16} =$$

$$4$$

radius

Take to two #'s from the center + square them

take the  $\sqrt{\quad}$

To Graph:

- Press the  $\odot$  button in right hand corner.
- Graph the center point first
- move out from the center the # of places the radius says and make 2<sup>nd</sup> point.