Geometry   10.8
Write the equation of a circle
Graph a circle on the coordinate plane
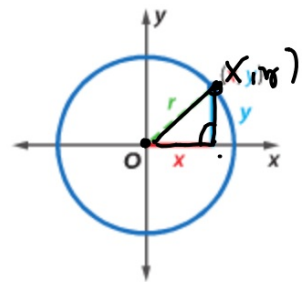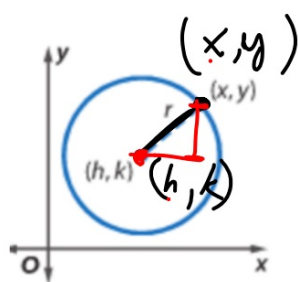
circle
center (x, y)
radius $r =$
pythagorean theorem (distance)
Factoring/Completing the Square (alg 1 Ch. 9)

Distance from (x,y) to (h,k)
(pythagorean theorem)

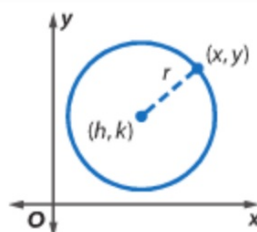$$(x-h)^2 + (y-k)^2 = r^2$$

x-coord   y-coord   hyp. (radius)

KeyConcept Equation of a Circle in Standard Form

The standard form of the equation of a circle with center at (h, k) and radius r is $(x - h)^2 + (y - k)^2 = r^2$.

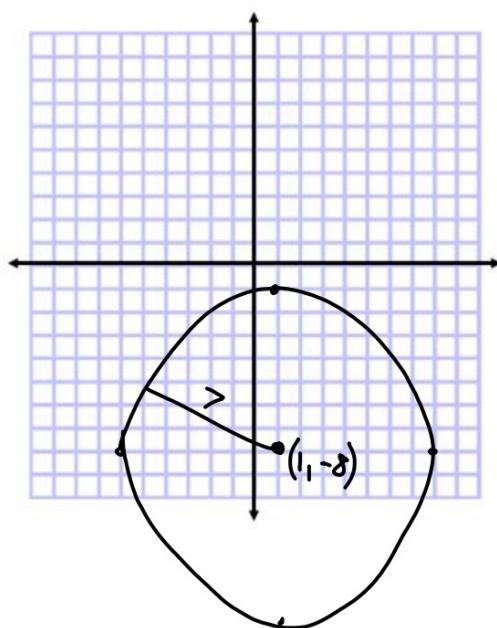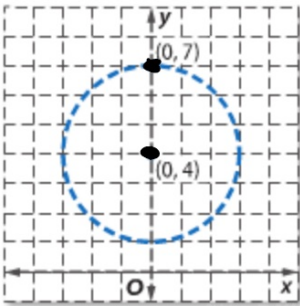The standard form of the equation of a circle is also called the *center-radius* form.

Example 1 Write an Equation Using the Center and Radius

Write the equation of each circle.

a. center at $(1, -8)$, radius 7

$$(x - 1)^2 + (y + 8)^2 = 49 \leftarrow r^2$$

$$(x-0)^2 + (y-4)^2 = 9$$

$$x^2$$

1A. center at origin, radius $\sqrt{10}$

1B. center at $(4, -1)$, diameter 8

$$\overset{4}{}$$

$$(x-0)^2 + (y-0)^2 = 10$$
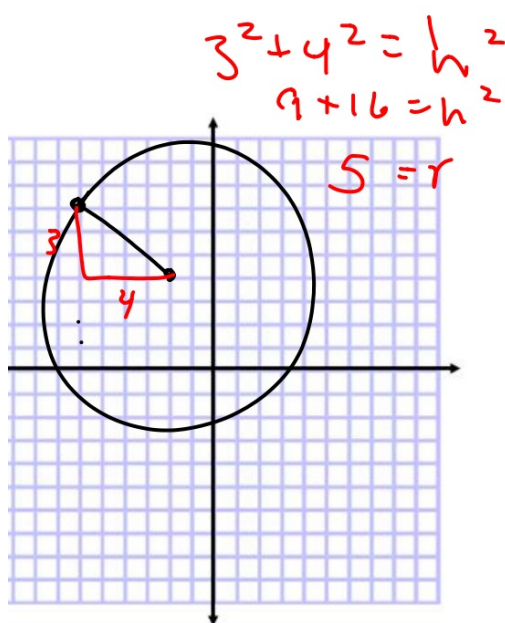
$$(x-4)^2 + (y+1)^2 = 16$$

Example 2 Write an Equation Using the Center and a Point

Write the equation of the circle with center at $(-2, 4)$, that passes through $(-6, 7)$.

$3^2 + 4^2 = h^2$

$9 + 16 = h^2$

$5 = r$

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

ıow?
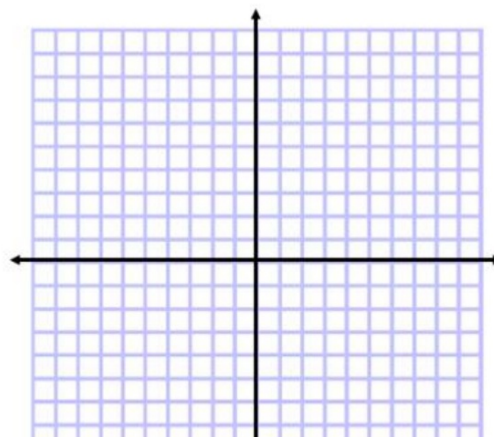
$$(x-h)^2 + (y-k)^2 = r^2$$

Example 3 Graph a Circle

The equation of a circle is $x^2 + y^2 - 8x + 2y = -8$. State the coordinates of the center and the measure of the radius. Then graph the equation.
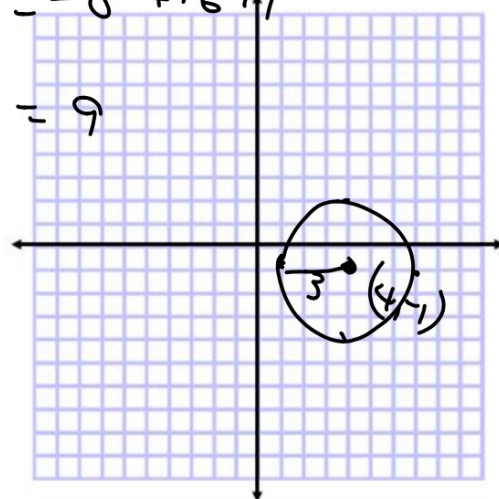
$$\left(x^2 - 8x + 16\right) + \left(y^2 + 2y + 1\right) = -8 + 16 + 1$$

$$= 9$$

$$\boxed{\left(x-4\right)^2 + \left(y+1\right)^2 = 9}$$

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

GuidedPractice

For each circle with the given equation, state the coordinates of the center and the measure of the radius. Then graph the equation.

3A. $x^2 + y^2 - 4 = 0$
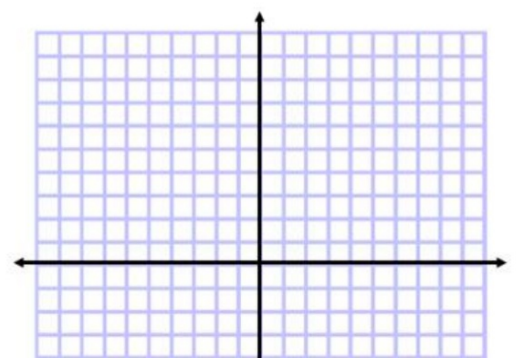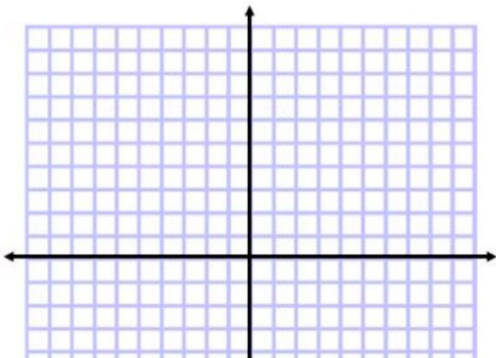$+4 \quad +4$

$x^2 + y^2 = 4$

$(x - 0)$

$r = 2$

$(0, 0)$

3B $x^2 + y^2 + 8x - 14y + 40 = 0$
$-40 \quad -40$

$(x^2 + 8x + 16) + (y^2 - 14y + 49) = -40$
$+49$
-40
$+16$

$(x + 4)^2 + (y - 7)^2 = 25$

$C(-4, 7) \quad r = 5$

Example 5 Intersections with Circles

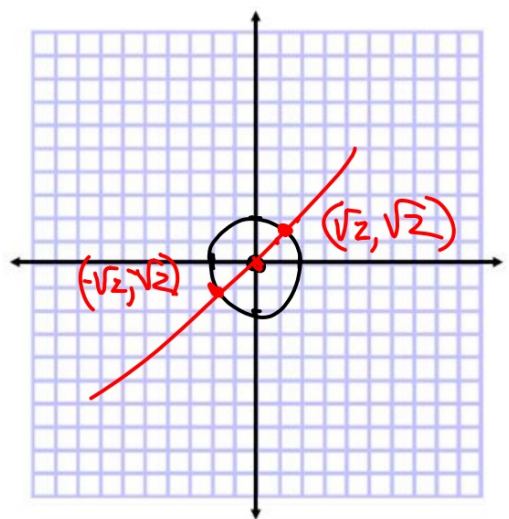Find the point(s) of intersection between $x^2 + y^2 = 4$ and $y = x.$

$$y = 1x \pm 0$$

$$x^2 + x^2 = 4$$

$$\frac{2x^2}{2} = \frac{4}{2}$$

$$\sqrt{x^2} = \sqrt{2}$$

$$x = \pm\sqrt{2}$$

$(\sqrt{2}, \sqrt{2})$

$(-\sqrt{2}, \sqrt{2})$

Write equations using 3 points...
:(

$(3, 3)$ $(5, 4)$ $(3, 1)$

5. Find the point(s) of intersection between $x^2 + y^2 = 8$ and $y = -x$.

$y = -x + 0$

$$x^2 + (-x)^2 = 8$$

$$x^2 + x^2 = 8$$

$$\frac{2x^2}{2} = \frac{8}{2} \qquad y = -x$$

$$\sqrt{x^2} = \sqrt{4}$$

$$x = \pm 2$$

10.8   13-350 odd

27

(-2, 2)

(2, -2)