Midpoint Formula:

$$\left(\underbrace{\frac{x_1+x_2}{2}}_{x_{midpoint}}, \underbrace{\frac{y_1+y_2}{2}}_{y_{midpoint}}\right)$$

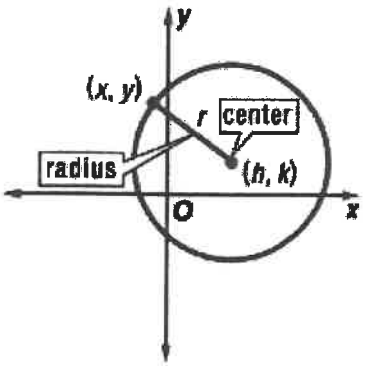
Distance Formula:

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

Circle: the set of all points in a plane that are equidistant from a given point, called the <u>center</u>

equation:

(x, y) on circle and (h, k) center



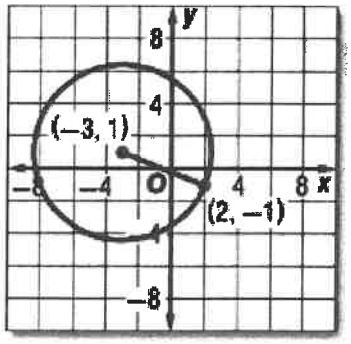
$$d = \sqrt{(x_1-x_2)^2 + (y_1-y_2)^2}$$

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

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

1. **Write an equation for the graph:**

a.



center (-3, 1)

need radius

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

use (2, -1)

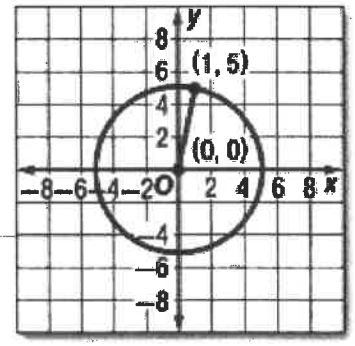
$r^2 = (2+3)^2 + (-1-1)^2$

$r = \sqrt{25+4}$

$r = \sqrt{29}$

$29 = (x+3)^2 + (y-1)^2$

b.



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

use $(1, 5)$

$r^2 = 1^2 + 5^2$

$r^2 = 26$

$26 = x^2 + y^2$

2. Write an equation for a circle if the endpoints of a diameter are at $(7, 6)$ and $(-1, -8)$.

midpoint ⇒ center

$\left(\frac{7+(-1)}{2}, \frac{6+(-8)}{2}\right)$

$(3, -1)$

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

use either pt to find r^2

$r^2 = (7-3)^2 + (6+1)^2$

$r^2 = 16 + 49$

$r^2 = 65$

$65 = (x-3)^2 + (y+1)^2$

3. Write an equation for a circle if the endpoints of a diameter are at $(3, -3)$ and $(1, 5)$.

midpoint:

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

$(2, 1)$

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

$r^2 = (1-2)^2 + (5-1)^2$

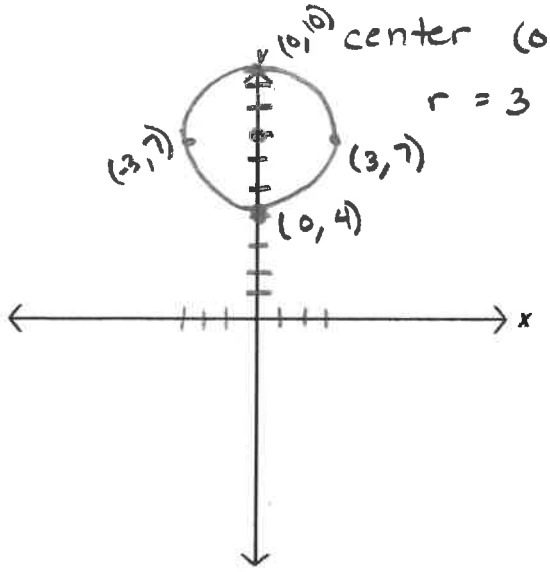
$r^2 = 1 + 16$

$r^2 = 17$

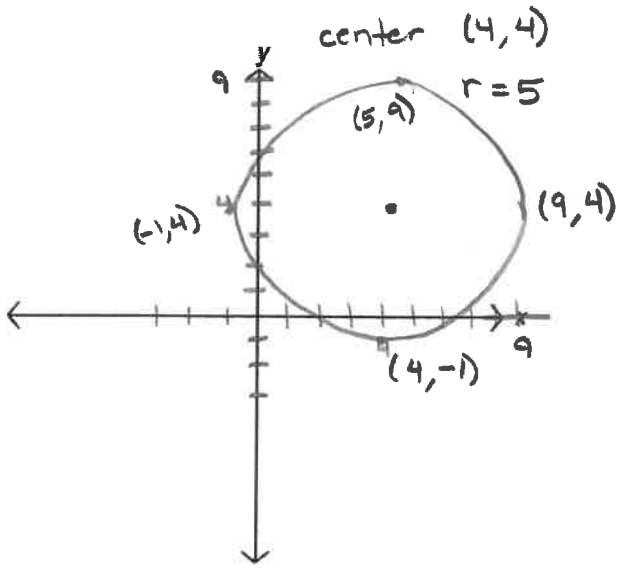
$17 = (x-2)^2 + (y-1)^2$

4. Find the center and radius of each circle. Then graph the circle.

a. $x^2 + (y-7)^2 = 9$



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



c. $x^2 + y^2 - 4x + 8y - 5 = 0$

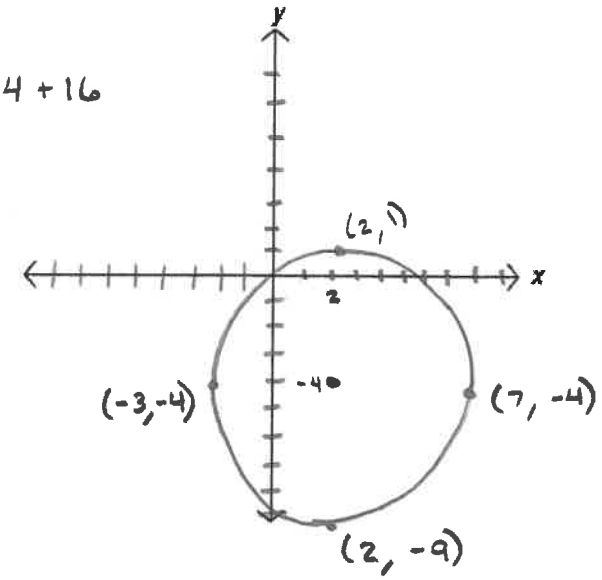
$x^2 - 4x + y^2 + 8y = 5$

$(x^2 - 4x + 4) + (y^2 + 8y + 16) = 5 + 4 + 16$

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

center $(2, -4)$

$r = 5$



d. $x^2 + y^2 - 8x + 12y - 12 = 0$

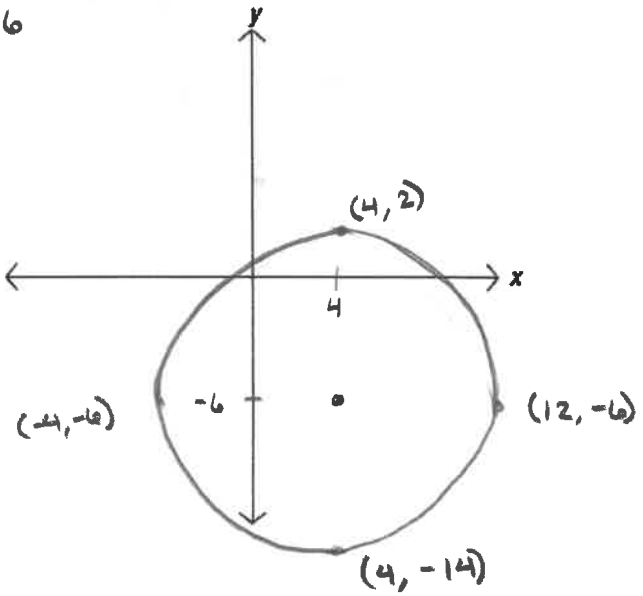
$x^2 - 8x + y^2 + 12y = 12$

$(x^2 - 8x + 16) + (y^2 + 12y + 36) = 12 + 16 + 36$

$(x-4)^2 + (y+6)^2 = 64$

$(4, -6)$

$r = 8$



e. $x^2 + y^2 + 4x - 10y - 7 = 0$

$x^2 + 4x + y^2 - 10y = 7$

$(x^2 + 4x + 4) + (y^2 - 10y + 25) = 7 + 4 + 25$

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

center $(-2, 5)$

$r = 6$