

EXERCISE 1: Identify the center and radius of each circle.

a. $(x - 12)^2 + (y - 9)^2 = 4$

radius: 2 center: (12, 9)

b. $(x - 3)^2 + (y - 5)^2 = 25$

radius: 5 center: (3, 5)

c. $(x - 6)^2 + (y + 3)^2 = 18$

radius: $3\sqrt{2}$ center: (6, -3)

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

radius: 7 center: (-2, 0)

e. $3x^2 + 3y^2 = 48$

radius: 4 center: (0, 0)

*Sometimes the equation will be in a different form that may make it more difficult to identify the center and radius. In these cases you will need to complete the square to change the form to make it easier to identify the center and radius of the circle.

$$Ax^2 + By^2 + Cx + Dy = E \rightarrow (x - h)^2 + (y - k)^2 = r^2$$

EXAMPLE 1: $x^2 + y^2 - 6x + 8y - 24 = 0$

- a. Rearrange your equation so the “x’s” are grouped, the “y’s” are grouped, and the constants are on the other side of the equation.

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

- b. Create a space to complete the square for the x’s and the y’s.

$$x^2 - 6x + \square + y^2 + 8y + \bigcirc = 24 + \square + \bigcirc$$

- c. Complete the square for the x’s.

$$x^2 - 6x + \square + y^2 + 8y + _____ = 24 + \square + _____$$

- d. Complete the square for the y’s.

$$x^2 - 6x + 9 + y^2 + 8y + \bigcirc = 24 + 9 + \bigcirc$$

- e. Simplify by factoring your x’s, y’s, and combining like terms.

$$(x - 3)^2 + (y + 4)^2 = 49$$

- f. What is the center and radius?

Center: (3, -4) and Radius = 7

EXERCISE 2:

a. $x^2 + y^2 + 2y - 10 = 0$

$$\begin{aligned} x^2 + y^2 + 2y + \underline{\quad} &= 10 + \underline{\quad} \\ x^2 + y^2 + 2y + 1 &= 10 + 1 \\ x^2 + (y + 1)^2 &= 11 \end{aligned}$$

radius: $\sqrt{11}$ center: $(0, -1)$

b. $x^2 + y^2 + 2x + 4y = 31$

$$\begin{aligned} x^2 + 2x + \underline{\quad} + y^2 + 4y + \underline{\quad} &= 31 + \underline{\quad} + \underline{\quad} \\ x^2 + 2x + 1 + y^2 + 4y + 4 &= 31 + 1 + 4 \\ (x + 1)^2 + (y + 2)^2 &= 36 \end{aligned}$$

radius: 6 center: $(-1, -2)$

c. $x^2 - 12x + 84 = -y^2 + 16y$

$$\begin{aligned} x^2 - 12x + \underline{\quad} + y^2 - 16y + \underline{\quad} &= -84 + \underline{\quad} + \underline{\quad} \\ x^2 - 12x + 36 + y^2 - 16y + 64 &= -84 + 36 + 64 \\ (x - 6)^2 + (y - 8)^2 &= 16 \end{aligned}$$

radius: 4 center: $(6, 8)$

EXERCISE 3: Determine if $(-1, 6)$ is on the circle $(x - 2)^2 + (y - 6)^2 = 9$.

$$(-1 - 2)^2 + (6 - 6)^2 ? 9$$

$$(-3)^2 + (0)^2 ? 9$$

$$9 = 9 \text{ ☺}$$

Yes, this point is on the circle.