

Rotations

Rotations of 90° will result in a line perpendicular to the original, so the slope will be the negative reciprocal. To write the equation of a line after a 90° rotation, use the same procedure for translations and dilations, except use the negative reciprocal of the slope.

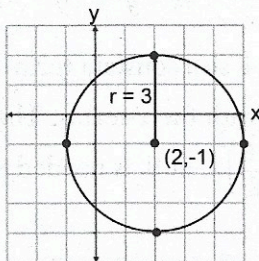
EQUATION OF THE CIRCLE**Center Radius Form of the Equation of a Circle**

$(x - h)^2 + (y - k)^2 = r^2$ where the center has coordinates (h, k) and radius has length r .

- To graph a circle, first identify the center and radius from the equation. Plot a point at the center. Then plot points up, down, left, and right a distance r from the center.

Example:

Graph the equation $(x - 2)^2 + (y + 1)^2 = 9$.



The center is located at $(2, -1)$, and $r^2 = 9$, so $r = 3$. We plot the center point at $(2, -1)$; then plot points up, down, right, and left 3 units from the center. Use these four points as a guide to complete the circle.

General Form of the Equation of a Circle

$$x^2 + y^2 + Cx + Dy + E = 0$$

To find the coordinates of the center and the radius from the general form of the equation, you will need to convert it to the center-radius form using the following procedure:

1. Group the x -terms and y -terms on one side of the equation, and the constant on the other side of the equation.
2. Complete the square with the x -terms, and then complete the square with the y -terms.

Example:

- Find the coordinates of the center and the length of the radius of a circle whose equation is $x^2 + 4x + y^2 - 6y + 7 = 0$.

Solution:

Bring the constant term to the right.

$$x^2 + 4x + y^2 - 6y = -7$$

The coefficient of x is 4, so a constant term of $\left(\frac{4}{2}\right)^2$, or 4, is needed to complete the square with the x -terms. The coefficient of y is -6 , so a constant term of $\left(\frac{-6}{2}\right)^2$, or 9, is needed to complete the square with the y -terms.

$$\begin{aligned}x^2 + 4x + 4 + y^2 - 6y + 9 &= -7 + 4 + 9 \\(x + 2)^2 + (y - 3)^2 &= 6\end{aligned}$$

The center has coordinates $(-2, 3)$ and the radius has a length of $\sqrt{6}$.