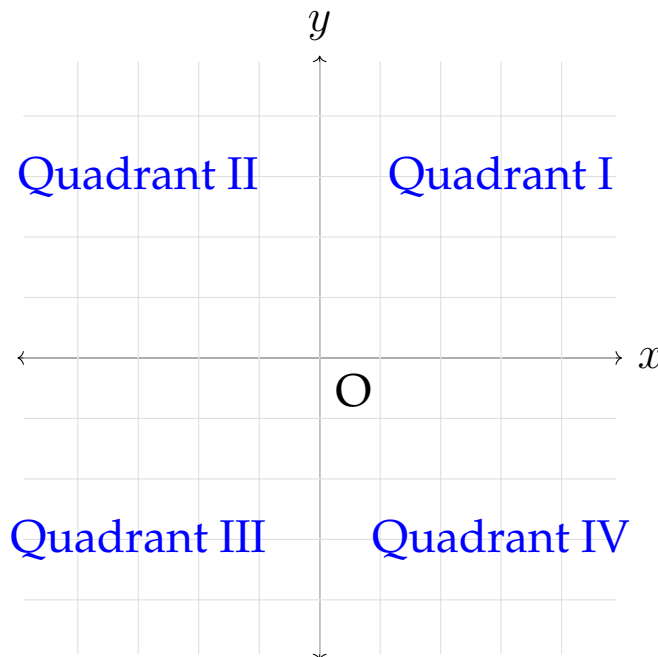


1. Introduction to the Coordinate System

The rectangular coordinate system (also called the Cartesian plane) consists of two perpendicular number lines:

- The horizontal line is called the _____
- The vertical line is called the _____
- The point where these lines intersect is called the _____



Quadrants:

- Quadrant I: Both x and y are _____
- Quadrant II: x is _____ and y is _____
- Quadrant III: Both x and y are _____
- Quadrant IV: x is _____ and y is _____

Plotting Points: Any point in the plane can be written as an ordered pair (x, y) where:

- x represents the _____
- y represents the _____

2. Distance and Midpoint Formulas

Distance Formula: The distance d between two points (x_1, y_1) and (x_2, y_2) is:

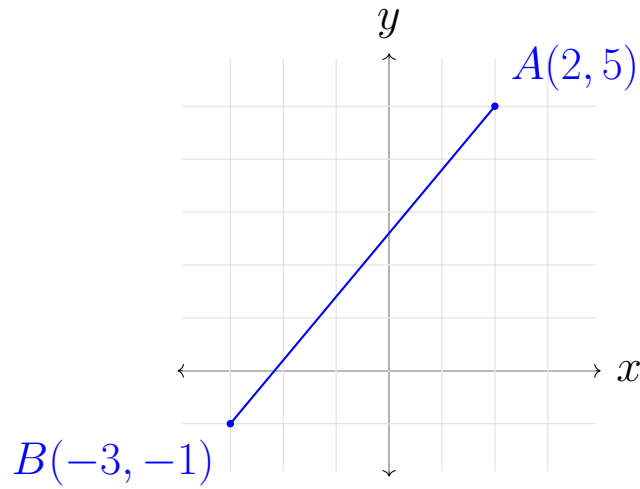
$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

Midpoint Formula: The midpoint $M(x, y)$ of a line segment with endpoints (x_1, y_1) and (x_2, y_2) is:

$$M \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

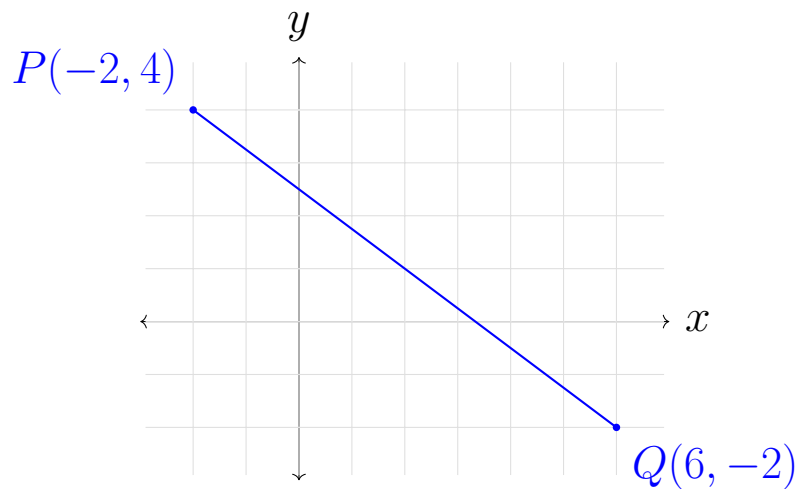
3. Examples

Example 1: Find the distance between points $A(2, 5)$ and $B(-3, -1)$



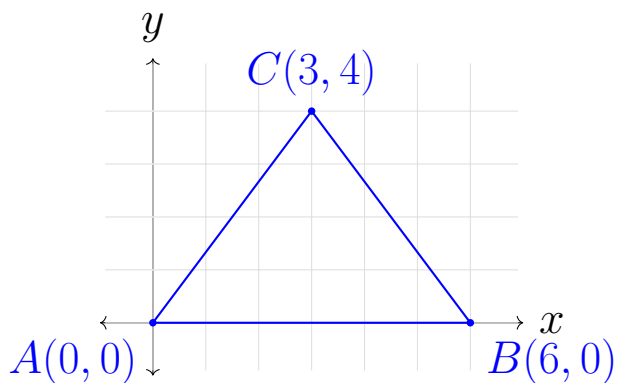
Solution:

Example 2: Find the midpoint of the line segment with endpoints $P(-2, 4)$ and $Q(6, -2)$



Solution:

Example 3: Determine if triangle ABC with vertices $A(0, 0)$, $B(6, 0)$, and $C(3, 4)$ is a right triangle.



Solution:

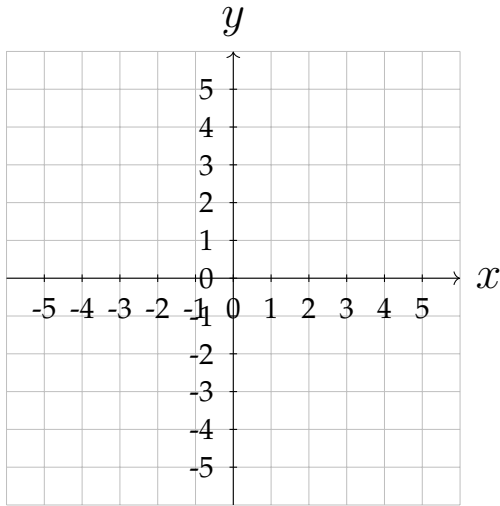
Practice Problems:

1. Plot the points $A(-3, 4)$, $B(2, -1)$, and $C(5, 3)$. Label which quadrant each point is in.
2. Find the distance between points $(1, 7)$ and $(4, -2)$ and the midpoint between them.

1. Circles

Next, we will start graphing specific categories of equations such as circles, ellipses, hyperbolas and parabola. We begin with circles.

Definition: A circle is the set of all points in a plane that are equidistant from a fixed point called _____. The fixed distance from any point on the circle to the center is called the _____.



Standard form of an equation of a circle

Given a circle centered at (h, k) with radius r , the standard form is

Example 1

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

2. $x^2 + (y - 1/2)^2 = 12$

3. $x^2 + y^2 = 7$

Example 2 Write the standard form of an equation of a circle with center $(-4, 6)$ and radius 2.

2. Recall: Distance and Midpoint Formulas

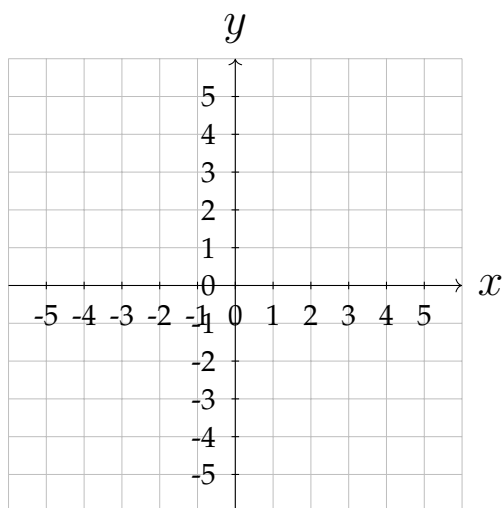
Distance Formula: The distance d between two points (x_1, y_1) and (x_2, y_2) is:

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

Midpoint Formula: The midpoint $M(x, y)$ of a line segment with endpoints (x_1, y_1) and (x_2, y_2) is:

$$M \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

Example 3 Write the standard form of an equation of a circle with the endpoints of the diameter as $(-1, 0)$ and $(3, 4)$. Graph the circle.



General form of an Equation of a circle

An equation of a circle written in the form $x^2 + y^2 + Ax + By + C = 0$ is called the general form of an equation of a circle.

Example 4 Write the equation of the circle in standard form by **completing the square**.

$$x^2 + y^2 + 10x - 6y + 25 = 0$$