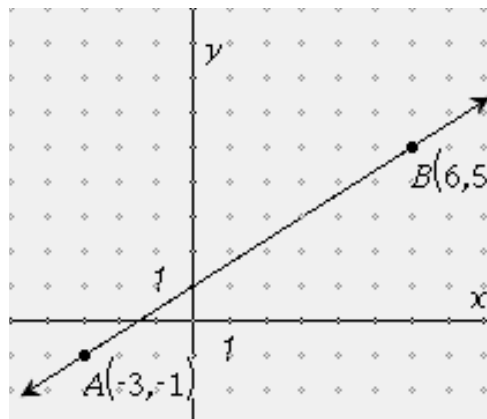


8-2: The Equation of a Line

Postulate: A , B , and C lie on the same line if and only if the slope of \overline{AB} is equal to the slope of \overline{BC} .

Let $A(-3, -1)$ and $B(6, 5)$ be two points on \overline{AB} . Let $P(x, y)$ be any other point on \overline{AB} . We can write the equation of \overline{AB} using the following fact:

$$\begin{aligned}\text{slope of } \overline{AB} &= \text{slope of } \overline{BP} \\ \frac{-1-5}{-3-6} &= \frac{y-5}{x-6} \\ \frac{-6}{-9} &= \frac{y-5}{x-6} \\ \frac{2}{3} &= \frac{y-5}{x-6} \\ 3(y-5) &= 2(x-6) \\ 3y-15 &= 2x-12 \\ 3y &= 2x+3 \\ y &= \frac{2}{3}x+1\end{aligned}$$



- Recall that when the equation is solved for y in terms of x , the coefficient of x is the slope of the line, and the constant term is the y -intercept, the y coordinate of the point where the line crosses the y -axis.
- This equation is called the **slope-intercept form** of the equation of a line.
$$y = mx + b$$
- The x -intercept is the x coordinate of the point where the line intersects the x -axis.

Procedure

To find the equation of a line given two points on the line:

1. Find the slope of the line using the coordinates of the two given points.
2. Let $P(x, y)$ be any point on the line. Write a ratio that expresses the slope of the line in terms of the coordinates of P and the coordinates of one of the given points.
3. Let the slope found in step 2 be equal to the slope found in step 1.
4. Solve the equation written in step 3 for y .

- When we are given the coordinates of one point, (a, b) and the slope of the line, m , the equation can be determined:

$$\frac{y-b}{x-a} = m$$

- This equation is called the **point-slope form** of the equation of the line.

Example:

The slope of a line through the point $A(3, 0)$ is -2 .

- a. Use the point-slope form to write the equation of the line.

- b. What is the y -intercept of the line?

- c. What is the x -intercept of the line?

Example:

- a. Show that the three points $A(-2, -3)$, $B(0, 1)$ and $C(3, 7)$ lie on the same line.

- b. Write an equation of the line through A , B , and C .

Homework: