Determine an equation of the line that passes through the points (3, 4) and (9, -2).

First, find the slope of the line.
\[ m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-2 - 4}{9 - 3} = \frac{-6}{6} = -1 \]

Next, substitute \( m = -1 \), \( x = 3 \) and \( y = -4 \) into \( y = mx + b \).

\[ -4 = (-1)(3) + b \]
\[ -4 = -3 + b \]
\[ b = -1 \]

An equation of the line is \( y = -x - 5 \).

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Equation of a Line Given Two Points

Note that we obtain the same answer if we use \( x = 9 \) and \( y = -2 \), since both points are on the line.

\[ -2 = \frac{1}{2}(9) + b \]
\[ -2 = 4.5 + b \]
\[ -6.5 = b \]

When choosing a point to substitute into \( y = mx + b \), choose the one that is easiest to work with. Small values, positive values, or values that “cancel out” fractions are often your best bet.
Equation of a Line Given Two Points

**Example**

Determine an equation of the line that passes through the points \((-2, -1)\) and \((0, 7)\).

Note that the second point has an \(x\)-coordinate of zero, indicating that it is the \(y\)-intercept. Thus, we just need to find the slope of the line.

\[
m = \frac{7 - (-1)}{0 - (-2)} = \frac{8}{2} = 4
\]

Therefore, an equation of the line is \(y = 4x + 7\). Remember to keep things simple, and look for shortcuts.

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Equation of a Line Given Two Points

**Example**

Determine the standard form equation of the line that passes through the points \((5, 7)\) and \((11, 10)\).

Start by determining the slope of the line.

\[
m = \frac{10 - 7}{11 - 5} = \frac{1}{2}
\]

Next, find the \(y\)-intercept of the line.

\[
7 = \frac{1}{2}(5) + b
\]

\[
14 = 5 + 2b
\]

\[
9 = 2b
\]

\[
\frac{9}{2} = b
\]

The slope-intercept equation of the line is \(y = \frac{1}{2}x + \frac{9}{2}\).

Convert this to standard form by eliminating any fractional values and gathering the \(x\) and \(y\) terms.

\[
y = \frac{1}{2}x + \frac{9}{2}
\]

\[
2y = x + 9
\]

\[
-x + 2y = 9
\]

\[
x - 2y = -9
\]

The standard form equation of the line is \(x - 2y = -9\).

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Questions?