

## Exercise 34

For the following exercises, given each set of information, find a linear equation satisfying the conditions, if possible.

Passes through  $(-1, 4)$  and  $(5, 2)$

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### Solution

The general formula for the equation of a line is

$$y = mx + b.$$

The first condition says that when  $x = -1$ ,  $y = 4$ .

$$4 = m(-1) + b$$

The second condition says that when  $x = 5$ ,  $y = 2$ .

$$2 = m(5) + b$$

This is a system of two equations with two unknowns that can be solved.

$$\begin{cases} -m + b = 4 \\ 5m + b = 2 \end{cases}$$

Subtract the respective sides of these two equations to eliminate  $b$ .

$$-m - 5m = 4 - 2 \quad \rightarrow \quad -6m = 2 \quad \rightarrow \quad m = -\frac{1}{3}$$

Multiply both sides of the first equation by 5

$$\begin{cases} -5m + 5b = 20 \\ 5m + b = 2 \end{cases}$$

and then add the respective sides of these two equations to eliminate  $m$ .

$$5b + b = 20 + 2 \quad \rightarrow \quad 6b = 22 \quad \rightarrow \quad b = \frac{11}{3}$$

Now that  $m$  and  $b$  are solved for, the equation of the line is known.

$$y = -\frac{1}{3}x + \frac{11}{3}$$