

Exercise 33

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

Passes through $(1, 5)$ and $(4, 11)$

Solution

The general formula for the equation of a line is

$$y = mx + b.$$

The first condition says that when $x = 1$, $y = 5$.

$$5 = m(1) + b$$

The second condition says that when $x = 4$, $y = 11$.

$$11 = m(4) + b$$

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

$$\begin{cases} m + b = 5 \\ 4m + b = 11 \end{cases}$$

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

$$m - 4m = 5 - 11 \quad \rightarrow \quad -3m = -6 \quad \rightarrow \quad m = 2$$

Multiply both sides of the first equation by -4

$$\begin{cases} -4m - 4b = -20 \\ 4m + b = 11 \end{cases}$$

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

$$-4b + b = -20 + 11 \quad \rightarrow \quad -3b = -9 \quad \rightarrow \quad b = 3$$

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

$$y = 2x + 3$$