

12. $(-4, 9)$ and $(2, -3)$ are two points on a line. Find the equation of the line by first finding its slope.

(a) find the slope: (x, y)
 $(2, -3)$
 $(-4, 9)$

(b) use the slope and just one of the points to find b :

$$m = \frac{-3 - 9}{2 - (-4)} = \frac{-12}{6} = -2$$

(i) Let's use $(-4, 9)$:

$$x = -4, y = 9, m = -2$$

$$y = mx + b$$

$$9 = -2(-4) + b$$

$$9 = 8 + b$$

$$1 = b$$

(ii) Let's use $(2, -3)$:

$$x = 2, y = -3, m = -2$$

$$y = mx + b$$

$$-3 = -2(2) + b$$

$$-3 = -4 + b$$

$$1 = b$$

This shows that it doesn't matter which point we use, we get the same value of b . On the test, you only need to use one point.

Equation of the line:

$$y = -2x + 1$$

Extra Credit:

Find the equation of the line that passes through $(-3, -6)$ and is perpendicular to $y = \frac{1}{4}x + 3$.

The only important part of this equation is the slope, $m = \frac{1}{4}$; the value of b doesn't matter here because we are looking for a brand new line with a different value of b .

(a) To be perpendicular, our new line must have a slope that is the opposite reciprocal of the original slope (above).

original slope: $m = \frac{1}{4}$ New, perpendicular slope, $m = -4$.

(b) use new slope with the point $(-3, -6)$.

$$x = -3, y = -6, m = -4$$

$$y = mx + b$$

$$-6 = -4(-3) + b$$

$$-6 = 12 + b$$

$$-18 = b$$

Equation of the line:

$$y = -4x - 18$$