

$$y - 3 = -\frac{1}{2}(x - 2)$$

$$y = -\frac{1}{2}(x - 2) + 3$$

$$y = -\frac{1}{2}x + 1 + 3 \quad ; \quad y = -\frac{1}{2}x + 4$$

The function is decreasing.

E.g. The population of a small town increased from 1442 to 1868 between 2009 and 2012. Suppose that the population change is linear. Find a linear function that models this population change. $(2009, 1442); (2012, 1868)$

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$$\text{Slope} = \frac{1868 - 1442}{2012 - 2009} = \frac{426}{3} = 142 \leftarrow m$$

Point-Slope Equation: $y - 1442 = 142(x - 2009)$

$$(2009, 1442) \quad y = 142x - 285278 + 1442$$

$$y = 142x - 283836$$

$$f(x) = 142x - 283836$$

Population in 2015: $f(2015) = 142 \cdot 2015 - 283836 = 2294$

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E.g. Bill sells insurance policies. His income I depends on the number of policies n he sells weekly. linearly. Last week he sold 3 new policies, he earned \$760. The week before he sold 5 new policies, he earned \$920. Find an equation, $I(n)$.

for $(3, 760)$ and $(5, 920)$

$$\text{Slope} = \frac{920 - 760}{5 - 3} = \frac{160}{2} = 80$$

$$y - 760 = 80(x - 3)$$

$$y = 80x - 240 + 760$$

$$y = 80x + 520$$

$I(n) = 80n + 520$

$I(10) = 800 + 520 = 1320$

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E.g. month

x	0	2	4	8	12
H(x)	12.5	13.5	14.5	16.5	18.5

$I, H(x)$ a linear function of x ?

$$\frac{1}{2} : \frac{1}{2}, \frac{2}{4} = \frac{1}{2}, \frac{2}{4} = \frac{1}{2}$$

Slope of $H(x) = \frac{1}{2}$ $y - 12.5 = \frac{1}{2}(x - 0)$

Point $(0, 12.5)$ $y = \frac{1}{2}x + 12.5$

E.g. Find linear function corresponding to this graph:

Slope = $\frac{2 - (-4)}{0 - (-2)} = \frac{6}{2} = 3$

$y - 2 = 3(x - 0) \Rightarrow y = 3x + 2$

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③ Graph Linear Functions

* Find 2 points on the graph and connect them.

E.g. Graph $f(x) = -\frac{3}{4}x + 6$.

x	f(x)
0	6
4	3

Find the x-intercept?

$$-\frac{3}{4}x + 6 = 0$$

$$-\frac{3}{4}x = -6 \quad ; \quad x = 8$$

x-intercept: $(8, 0)$

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To find the x-intercept of $f(x) = mx + b$. We set $mx + b = 0$ and solve for x .

Horizontal and Vertical lines

$f(x) = mx + b$ Slope $m = 0$

$y = b$

$x = a$

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