

Topics: Equations of lines, parallel and perpendicular lines, linear models, average rate of change

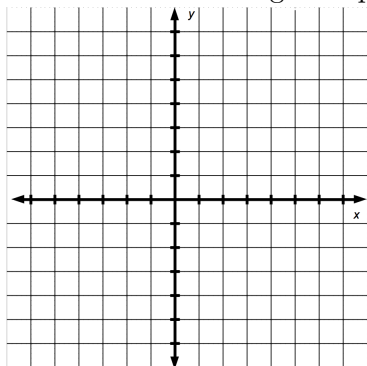
Student Learning Outcomes:

1. Students will be able to graph linear equations.
 2. Students will be able to determine the slope of a line and apply the slope-intercept form of a line.
 3. Students will be able to compute the average rate of change of a function.
-

1 Slope of a Line

The slope of a line is $m = \frac{y_2 - y_1}{x_2 - x_1}$.

1. Sketch the line through the pair of points $P(4, 2)$ and $Q(-3, 5)$, and find the slope of the line.



The point-slope equation for the line through the point (x_1, y_1) with slope m is $y - y_1 = m(x - x_1)$.

2. Determine a *point-slope* equation for the line through $P(4, 2)$ and $Q(-3, 5)$. (See above.)

The slope-intercept equation for the line with slope m and y -intercept b is $y = mx + b$.

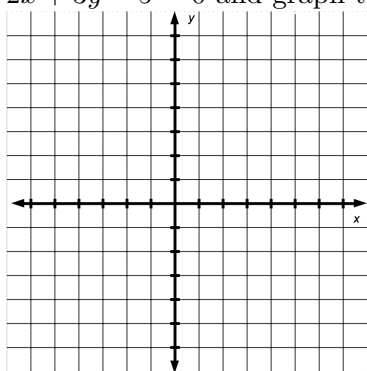
3. Determine the *slope-intercept* equation for the line through $(3, -2)$ which has slope -4 .

Horizontal lines have 0 slope and **vertical lines** have undefined slopes.

2 Parallel and Perpendicular Lines

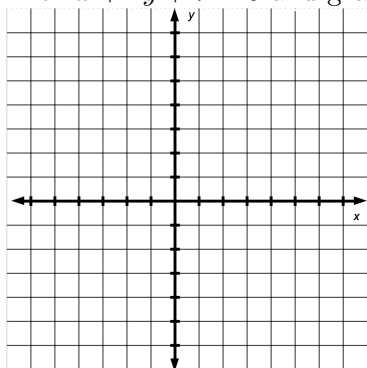
Parallel lines have the *same slope*.

4. Determine a point-slope equation for the line through $(-1, 2)$ which is parallel to the line $2x + 3y - 5 = 0$ and graph the equation.



Perpendicular lines have slopes that are “negative reciprocals” of each other. If m_1 is the slope of one of the lines, then the slope of the other line must be $-1/m_1$.

5. Determine an equation of the line through the point $(-3, 1)$ which is perpendicular to the line $2x + 4y + 7 = 0$ and graph the equation.



3 Average Rate of Change

Average Rate of Change

Given any function $y = f(x)$, we calculate the average rate of change of y with respect to x over the interval $[x_1, x_2]$ by dividing the change in value of y , $\Delta y = f(x_2) - f(x_1)$, by the length $\Delta x = x_2 - x_1$ of the interval over which the change occurs.

The *average rate of change* of $y = f(x)$ with respect to x over the interval $[x_1, x_2]$ is

$$\frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{f(x_2) - f(x_1)}{x_2 - x_1}$$

Note: An average rate of change needs two points (or endpoints on an interval).

6. Given the function defined $f(x) = x^2 - 1$, determine the average rate of change from $x_1 = -2$ to $x_2 = 0$.

Student Learning Outcomes Check

1. Can you graph a linear equation?
2. Can you determine the slope of a line and apply the slope-intercept form of a line?
3. Can you compute the average rate of change of a function?

If any of your answers were no, please ask about these topics in class.