3.3 Slope

Definition 3.3.1 (Slope)

- describes the *steepness* of the line
- defined as $m = \frac{\delta y}{\delta x} = \frac{\text{rise}}{\text{run}} = \frac{y_2 - y_1}{x_2 - x_1}$
- describes how quickly one variable changes with respect to another variable

Example 3.3.1
Find the slope of the line containing the points $(-3, 4)$ and $(-4, -2)$.

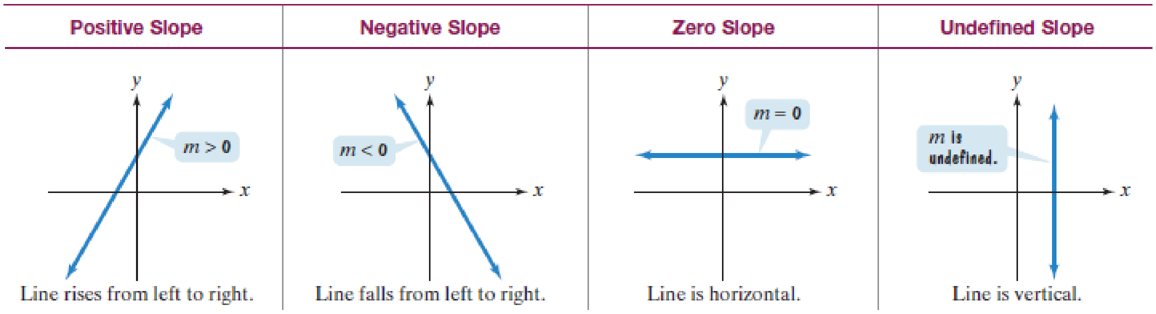
Example 3.3.2
Find the slope of the line containing the points $(4, -2)$ and $(-1, 5)$.

Horizontal & Vertical Lines

Example 3.3.3
Find the slope of the line
containing the points $(5, 4)$ and $(3, 4)$.

Example 3.3.4
Find the slope of the line
containing the points $(2, 5)$ and $(2, 1)$.

Visualizing Slope



Parallel & Perpendicular Lines

Definition 3.3.2 (Parallel Lines)
Two lines that never intersect are said to be parallel. Two parallel lines have the same slope; that is, $m_1 = m_2$.

Example 3.3.5
Show that the line passing through $(4, 2)$ and $(6, 6)$ is parallel to the line containing the points $(0, -2)$ and $(1, 0)$.

Definition 3.3.3 (Perpendicular Lines)
If two lines intersect and form a 90 deg angle, they are said to be perpendicular. If two lines are perpendicular, then the product of their slopes is -1.

$$m_1 \cdot m_2 = -1$$

We say that their slopes are *negative reciprocals*.

Example 3.3.6
Show that the line containing the points $(-1, 4)$ and $(3, 2)$ is perpendicular to the line containing $(-2, -1)$ and $(2, 7)$.

Example 3.3.7
In 2000, 11.2 million men lived alone.
In 2013, 15 million men lived alone.
Find the *average rate of change* and describe what it means.