Lesson 3.3

Rate of Change and Slope

slope: the steepness of a line, which is determined by the change in $y$ divided by the change in $x$

$$\text{slope} = \frac{\text{rise}}{\text{run}} = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1}$$

for $(x_1, y_1)$ and $(x_2, y_2)$

- positive slope
- negative slope
- zero slope
- undefined slope
For the graphs:

- From L → R, the graph is decreasing.
  - Slope = $\frac{\text{rise}}{\text{run}} = \frac{-5}{-1} = 5$

- From L → R, the graph is vertical.
  - Slope = $\frac{\text{rise}}{\text{run}} = \frac{7}{0}$ (Undefined)

- From L → R, the graph is horizontal.
  - Slope = $\frac{\text{rise}}{\text{run}} = \frac{0}{5} = 0$

For the points (x₁, y₁) and (x₂, y₂):

- $\text{slope} = \frac{y₂ - y₁}{x₂ - x₁} = m$

By the change in x = Δx

- Δy = mΔx
• Find the value of \( r \) so that the line through \((6,3)\) and \((r,9)\) has a slope of \(-2\).

\[
m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{9 - 3}{r - 6} = -2
\]

Set up a proportion:

\[
\frac{6}{r - 6} = \frac{-2}{1}
\]

Cross multiply:

\[
6(1) = -2(r - 6)
\]

\[
6 = -2r + 12
\]

\[
-12
\]

\[
\frac{-12}{-2} = -6
\]

\[
\frac{-6}{-2} = 3 = r \rightarrow \boxed{r = 3}
\]

• In 2000, calculators cost $9.50. By 2016, the calculators cost $13.50. Find the rate of change in price over the years.

\((2000, 9.50)\) and \((2016, 13.50)\)

\[
m = \frac{13.50 - 9.50}{2016 - 2000} = \frac{4}{16} = 0.25
\]

The cost increased by $0.25 each year.