

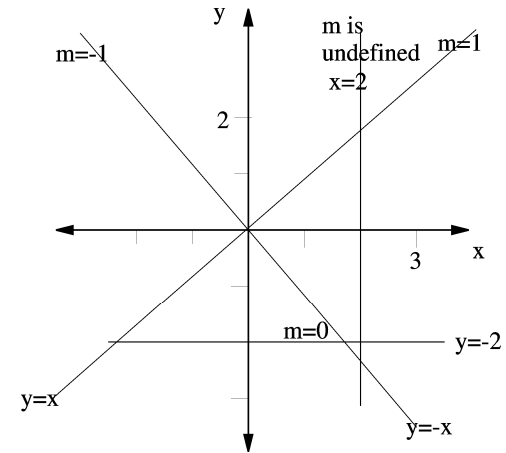
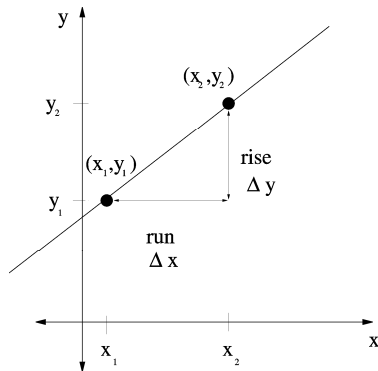
Chapter1: Lines and Linear Modeling

1.2 Straight Lines

A vertical line has NO SLOPE. All other lines have a slope given by the equation

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

The slope is a ratio of how y changes as x changes:



NOTE:

- Horizontal lines have zero slope
- Vertical lines have undefined slope
- Two lines are parallel if their slopes are equal,
 $m_1 = m_2$
- Two lines are perpendicular if $m_1 \times m_2 = -1$

POINT-SLOPE form of a line: $y - y_1 = m(x - x_1)$

SLOPE-INTERCEPT form of a line: $y = mx + b$
 m is the slope and $(0, b)$ is the y -intercept

GENERAL form of a line: $Ax + By + C = 0$

Example: A line has a slope of 2 and goes through the point (3,4). What is the equation, in slope-intercept form, of the line?

Answer:

Use the point-slope equation with $m = 2$, $x_1 = 3$ and $y_1 = 4$.

$$y - 4 = 2(x - 3)$$

$$y = 2x - 6 + 4$$

$$y = 2x - 2$$

x -intercept: where the line crosses the x -axis ($y = 0$).

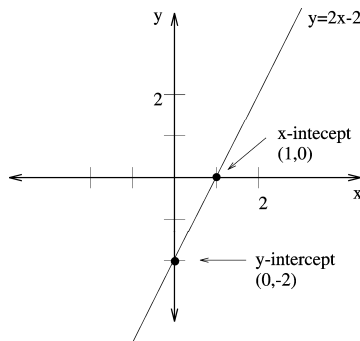
y -intercept: where the line crosses the y -axis ($x = 0$).

Example: Find the intercepts for the line $y = 2x - 2$.

Answer:

For the x -intercept set $y = 0$: $0 = 2x - 2 \rightarrow 2x = 2 \rightarrow x = 1$

For the y -intercept set $x = 0$: $y = 2(0) - 2 = -2$



1.3 Linear Functions and Mathematical Models

A linear model is a model that is a linear function,

$$f(x) = y = mx + b$$

x is the independent variable (horizontal axis)

y the dependent variable (vertical axis).

Domain is the allowed values for the independent variable.

Six business models are covered:

- Cost
- Revenue
- Profit
- Supply
- Demand
- Value (Depreciation)