# Chapter 2 Functions, Equations, and Graphs

## Direct Variation

$y = kx$ or $\frac{y}{x} = k$, where $k \neq 0$.

## Slope of a Line Containing $(x_1, y_1)$ and $(x_2, y_2)$

$$\text{slope} = \frac{\text{vertical change (rise)}}{\text{horizontal change (run)}} = \frac{y_2 - y_1}{x_2 - x_1},$$

where $x_2 - x_1 \neq 0$

When two lines have the same slope, they are **parallel**. When two lines have slopes that are negative reciprocals of each other, they are **perpendicular**.

## Slope-Intercept Form (Lesson 2-3)

$y = mx + b$

$y = 2x - 1$


## Point-Slope Equation of a Line

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

A **relation** is a set of ordered pairs. The **domain** of a relation is the set of $x$-coordinates. The **range** is the set of $y$-coordinates. When each element of the domain is paired with exactly one element of the range, the relation is a **function**.

## Function Families

Assume $a$, $k$, and $h$ are positive numbers.

| | |
|---|---|
| Parent | $y = f(x)$ |
| Reflection across $x$-axis | $y = -f(x)$ |
| Vertical stretch ($a > 1$)<br>Vertical shrink ($0 < a < 1$) | $y = af(x)$ |
| Translation | |
| horizontal to left by $h$ | $y = f(x + h)$ |
| horizontal to right by $h$ | $y = f(x - h)$ |
| vertical up by $k$ | $y = f(x) + k$ |
| vertical down by $k$ | $y = f(x) - k$ |

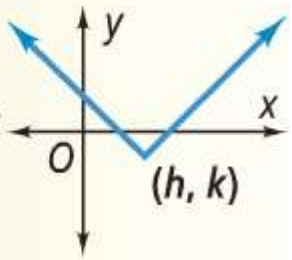
## Absolute Value Functions and Graphs (Lesson 2-7)

Parent: $y = |x|$

General form:

$y = a|x - h| + k$

vertex: $(h, k)$




## Two Variable Inequalities

An inequality describes a region of the coordinate plane that has a **boundary**. To graph an inequality involving two variables, first graph the boundary. Then determine which side of the boundary contains the solutions. Points on a dashed boundary are not solutions. Points on a solid boundary are solutions.