Section 3.5

Introduction to Functions

Distinguish between independent and dependent variables.
We often describe one quantity in terms of another:

The amount of your paycheck if you are paid hourly depends on the number of hours you worked.

The cost at the gas station depends on the number of gallons of gas you pumped into your car.

The distance traveled by a car moving at a constant speed depends on the time traveled.

If the value of the variable $y$ depends on the value of the variable $x$, then $y$ is the dependent variable and $x$ is the independent variable.
A relation is a set of ordered pairs.
Example: \{(-1, 1), (0,0), (1, 1), (-2, 4)\}

A function is a relation in which for each first element of the ordered pair, there is exactly one value for the second element.

Example: $A = \{(-2, 4),(-1, 1), (0, 0), (1, 1)(2, 4)\}$
$B = \{(4, -2), (1, -1), (0, 0), (1, 1), (4, 2)\}$

$A$ is a function; $B$ is not.
A function cannot have more than one y-value for any x-value.

**Define and identify relations and functions.**

Relations and functions can also be expressed as a correspondence or *mapping* from one set to another.

![Diagram showing functions and non-functions]( Slide 3.5-4)
\[ y = 2x - 4 \] is a function, because for each value of \( x \) there is only one value for \( y \).

In this function, \( x \) is the independent variable and \( y \) is the dependent variable. The value of \( y \) depends upon the value you choose for \( x \).

The values of the independent variable make up the domain and the values of the dependent variable make up the range.

Look at set \( A = \{(-2, 4), (-1, 1), (0, 0), (1, 1), (2, 4)\} \) and set \( B = \{(4, -2), (1, -1), (0, 0), (1, 1), (4, 2)\} \).

\begin{align*}
\text{Domain of } A &= \{-2, -1, 0, 1, 2\} \\
\text{Range of } A &= \{4, 1, 0\} \\
\text{Domain of } B &= \{4, 1, 0\} \\
\text{Range of } B &= \{-2, -1, 0, 1, 2\}
\end{align*}
Finding Domains and Ranges from Graphs

Give the domain and range of the relation.

Solution:

![Graph showing domain and range with arrowheads indicating the line extends indefinitely left and right.]

Domain: \((-\infty, \infty)\)

Range: \((-\infty, 4]\)

Find the domain and the range of each.

![Graphs with points and lines indicating domains and ranges.]

Domain: 
Range: 

Domain: 
Range: 
The Vertical Line Test for a Function

A relation is a function if there is no vertical line that will intersect its graph in more than one point.