MATH 1314

Section 3.1

Functions: Basic Ideas

The rest of this course deals with **functions.**

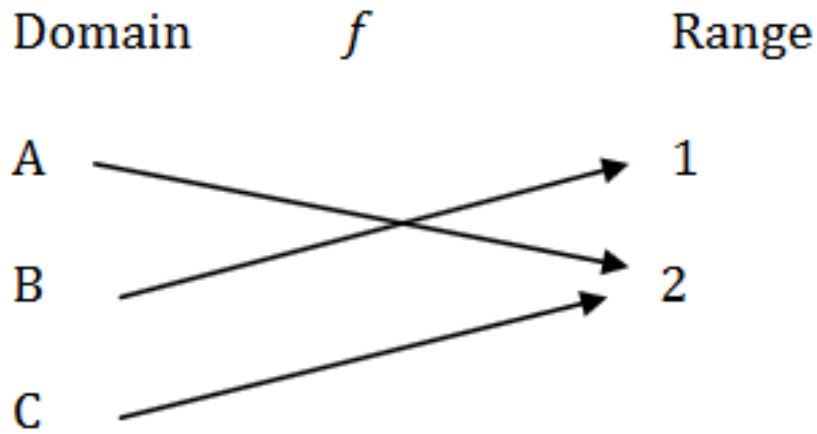
Definition: A **function**, f, is a rule that assigns to each element x in a set A exactly one elements, called $f(x)$, in a set B.
Functions are so important that we use a special notation when working with them. We'll write $f(x)$ to denote the value of function f at x. We read this as "f of x." We can use letters other than f to denote a function, so you may see a function such as $g(x)$, $h(x)$ or $P(x)$.

Definition: The set A is called the **domain** and is the set of all valid inputs for the function.

Definition: The set B is called the **range** and is the set of all possible values of $f(x)$ as x varies throughout the domain.
Sets A and B will consist of real numbers.

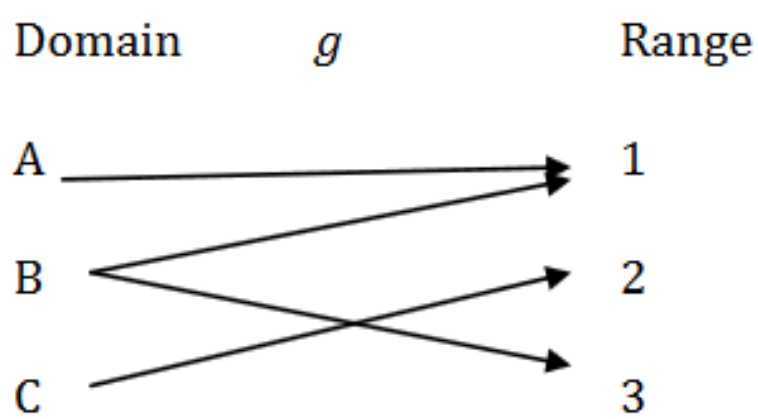
Example 1:

a. Given:



Is f a function?

b. Given:



Is g a function?

Next we'll consider some things you'll need to be able to do when working with functions. First, you'll need to be able to evaluate all types of functions when given a specific value for the variable.

Example 2: Let $f(x) = x^2 - 4x$ Calculate

a. $f(-3)$

c. $f(3x)$

b. $-2f(x)$

d. $f(x+2)$

Example 3: Suppose $g(x) = \begin{cases} 2x - 6, x < -2 \\ x^2 + 2x + 3, x \geq -2 \end{cases}$. Calculate the following

a. $g(-5)$

b. $g(-2)$

c. $g(3)$

Finding the Domain of a Function

Recall: The domain is the set of all real numbers for which the expression is defined as a real number. Exclude from a function's domain real numbers that cause division by zero or real numbers that result in an even root of a negative number.

We express the set of real numbers as $(-\infty, \infty)$.
The domain of any polynomial function is $(-\infty, \infty)$.

Example 4: Find the domain of each function below and express your answer in interval notation.

a. $f(x) = -17$

b. $f(x) = 3x - 4$

c. $h(x) = \frac{5x}{2x-8}$

d. $f(x) = \frac{x-1}{2x-6}$

e. $p(x) = \frac{x^2-16}{x^2-4x-12}$

g. $j(x) = \frac{\sqrt{x-5}}{x+2}$

f. $h(x) = \sqrt{x}$

$$q(x) = \sqrt{x - 4}$$

$$f(x) = \sqrt[3]{2x + 4}$$

$$g(x) = \sqrt[10]{42 - 2x}$$