Math 1310
Section 3.1: Functions- Basic Ideas

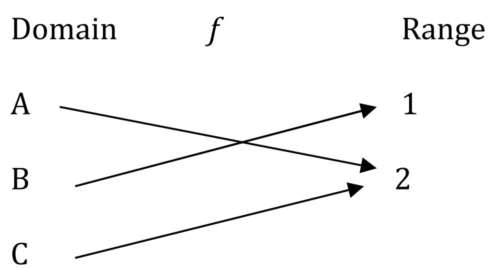
The rest of this course deals with **functions.**

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.

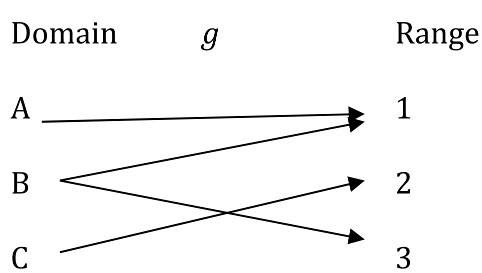
Definition: The set B is called the **range** and is the set of all possible values of *f*(*x*) as *x* varies throughout the domain.
Sets A and B will consist of real numbers.

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. $f(-3)$

b. $-2f(x)$

c. $f(3x)$

d. $f(x+2)$

Example 3: Suppose $g(x) = \begin{cases} 2x - 6 & x < -2 \\ x^2 + 2x + 3, & -2 \leq x < 3 \\ 4x - 12 & x \geq 3 \end{cases}$ Calculate the following

a. $g(-5)$

b. $g(-2)$

c. $g(5)$

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. $f(x) = \dfrac{x-1}{5x+10}$

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

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

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

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

h. $f(x)=\dfrac{\sqrt[10]{42-6x}}{x^2-11x+10}$