Relations and Functions

Basic Definition of a relation:
A relation is a set of ordered pairs of real numbers. The ***domain*** of a relation is the set of all first coordinates in the relation and the ***range*** of a relation is the set of all second coordinates in the relation.

Basic definition of a function:
A function is a relation such that no two ordered pairs have the same first coordinates and different second coordinates.

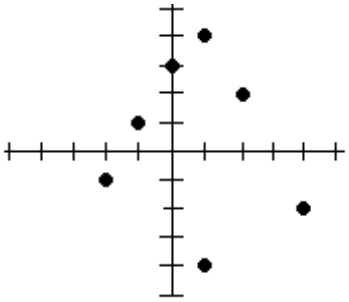
Examples:
Determine the domain and the range of the following relations and then determine if each relation is a function:

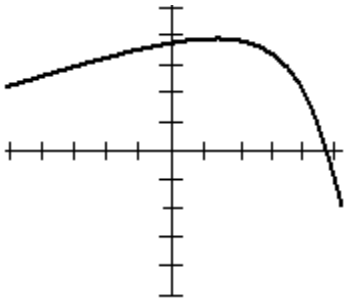
{(1,3) (2,4) (3,5) (6,7) (8,9)}

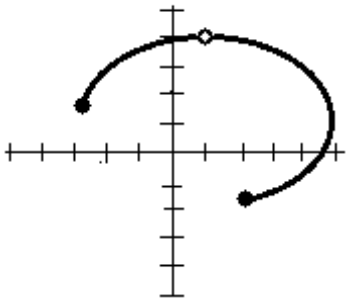
{(1,3) (2,3) (3,3) (4,3) (5,3)}

{(1,3) (2,5) (0,1) (-1,8) (0,2)}

Examples:
Determine the domain and the range of the following relations and then determine if each relation is a function:







The Vertical Line Test

Examples of equations that are used as rules to define functions.

$y = 2x + 3$

$y = x^2 + 2$

$A = \pi r^2$

Function Notation :
The equation $y = 2x + 3$ written as $f(x) = 2x + 3$

Example:
Let $f(x) = \frac{5x^2+2}{x-1}$

What is $f(1)$?

What is $f(-2)$?

What is $f(a)$?

What is $f(x+2)$?

What is the domain of f ?

Example:
Let $h(x) = \sqrt{2x+3}$

What is $h(1)$?

What is $h(-2)$?

What is $h(a)$?

What is $h(x-1)$?

What is the domain of h ?

The Difference Quotient: $\frac{f(x+h)-f(x)}{h}$

If $f(x) = 3x + 2$ then find and simplify the difference quotient

$\frac{f(x+h)-f(x)}{h} =$

If $s(x) = x^2 + 2x - 1$ then find and simplify the difference quotient

$\frac{s(x+h)-s(x)}{h} =$