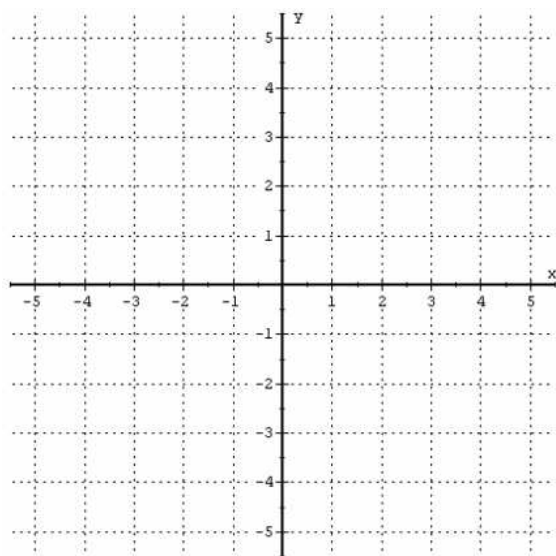


**Functions and Domains:**

Definition: A relation in mathematics is a set of one or more ordered pairs. It can be described by:

1. A set of ordered pairs:  $\{(-3, -1), (-2, 1), (-1, 1), (1, 3), (3, 1), (3, 2), (0, 3)\}$

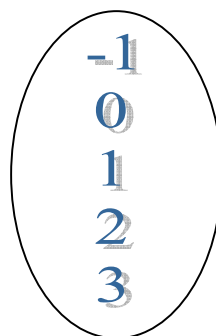
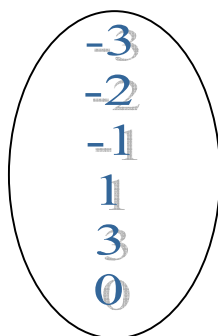
2. Graphs:



3. Tables:

x	y
-3	-1
-2	1
-1	1
1	3
3	1
3	2
0	3

4. Mappings:



The DOMAIN of a relation is the set of all the first elements (the  $x$ -values or  $x$ -coordinates) in the ordered pairs.

The RANGE of a relation is the set of all the second elements (the  $y$ -values or  $y$ -coordinates) in the ordered pairs.

A FUNCTION is a special relation in which each element,  $x$ , of the domain is paired with *exactly (only) one* element, called  $f(x)$ , of the range. One way to test a relation to see if it is a function is by using the vertical line test.

1. Is the given relation a function?

a)  $\{(1,-1), (2,5), (3,4)\}$

Domain:

Range:

b)  $\{(1,2), (4,5), (3,2)\}$

Domain:

Range:

c)  $\{(1,2), (4,5), (4,2)\}$

d)  $\{(1,1), (0,0), (4,4)\}$

In the equation  $y = f(x)$ , the symbol  $f(x)$  is read “ $f$  of  $x$ ” and is the value of the function  $f$  at the number  $x$ . The range of  $f$  is the set of all possible values of  $f(x)$  as  $x$  varies throughout the domain.

To evaluate  $f$  at a number, substitute the number for  $x$  into the definition of  $f$ . (Wherever there’s an  $x$  in the equation, use the number in parentheses instead and simplify.)

2. If  $f(x) = 6x - 5$ , calculate  $f(4)$ .

3. If  $f(x) = 5x^2 + 4x - 7$ , calculate  $f(-2)$ .

4. If  $f(x) = -2x^4 + 3x^3 + x^2 - 2x$ , calculate  $f(-1)$ .

5. If  $f(x) = \frac{10}{2x+4}$ , calculate  $f\left(\frac{1}{2}\right)$ .

6. If  $f(x) = |2x - 5|$ , calculate  $f(1)$ .

**Domain of a function:**

To find the domain of a function, one must determine what all possible  $x$ -values can go into the equation to get valid  $y$ -values. We ask, "Is there anything  $x$  cannot equal?" for a function.

If the answer to the question is "no," then the domain is all real numbers, written  $(-\infty, \infty)$  or  $\mathbb{R}$ .

If the function has an  $x$  on the bottom of a fraction, then the domain cannot contain the number(s) that makes the denominator equal to zero (since division by zero is impossible).

7. Find the domain of the function  $f(x) = 4x + 15$ .

8. Find the domain of the function  $f(x) = \frac{4x-1}{5}$ .

9. Find the domain of the function  $f(x) = \frac{5}{4-x}$ .

10. Find the domain of the function  $f(x) = \frac{x+4}{x-3}$ .

11. Find the domain of the function  $f(x) = \frac{x}{(x+1)(x-2)}$ .

12. Find the domain of the function  $f(x) = \frac{5}{x^2 - 16}$ .

**Radical Functions:** If the function has an  $x$  on the inside of a square root sign, then the domain cannot contain those numbers which make the inside negative (since we can't take the square root of a negative number).

13. Find the domain of the function  $f(x) = \sqrt{x-2}$ .

14. Find the domain of the function  $f(x) = \sqrt{8-2x}$ .