Translations - 10

A **relation** is a set of ordered pairs.

e.g.: (0,0); (1,1); (2,2); (1,-1); (2,-2)

A relation may contain a very large number of ordered pairs.

The **domain** for this relation is the set of x-values; { 0, 1, 2 }.

The **range** for this relation is the set of y-values; { -2, -1, 0, 1, 2 }.

A **function** is a relation in which each x-value is assigned only one y-value. We write y = f(x) to represent a function of x.

example: The equation y = | x | (absolute value of x) is an example of a function. There are an infinite number of ordered pairs. The domain is the set { real numbers }. The range is the set { real numbers $\geq$ 0 }.

example: The equation $x = y^2$ is an example of a relation (but not a function).

Shifting Relations and Functions

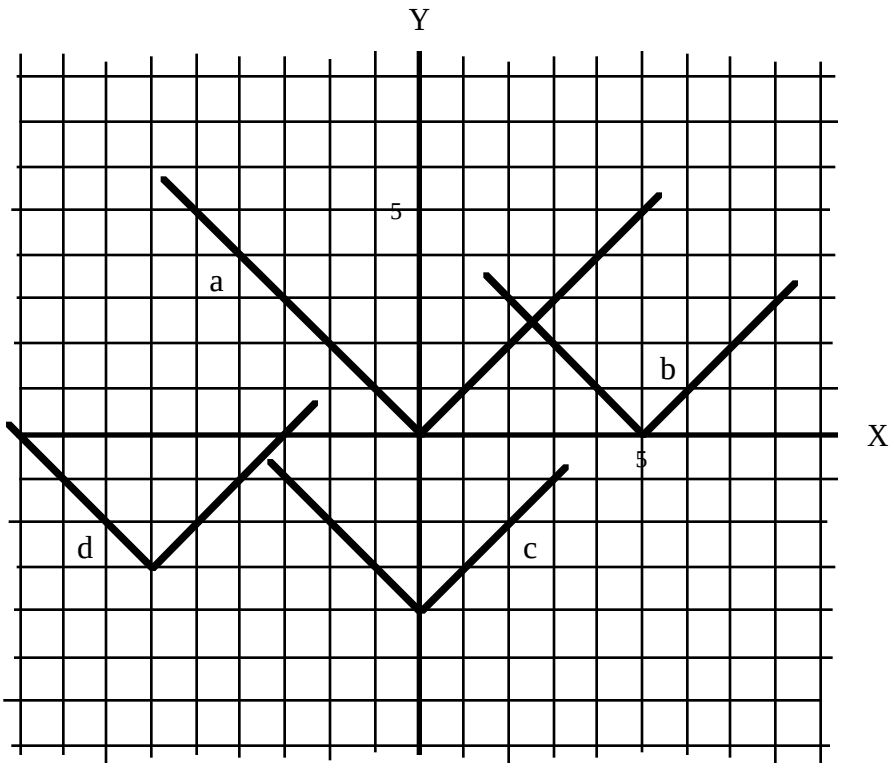
We can shift the function y = | x | to the right by two units if we replace x by x - 2. If x is replaced by x + 3, the shift is three units to the left.

If y is replaced by y - 1, the function is shifted up one unit. The function shifts down one unit when y is replaced by y + 1.

If y is replaced by y - 2 **and** x is replaced by x + 1, then the relation is shifted up two and to the left by one.

example: The following equations are graphed below; a) y = | x |,

b) y = | x - 5 |, c) y + 4 = | x |, d) y + 3 = | x + 6 |



Problems:

1) Define:

a) relation:

b) domain:

c) range:

d) function:

2) State whether or not the following relations are functions.

a) (-3,0); (-2,0); (-1,0); (0,0); (1,1); (2,2)

b) $x = y^2$

c) $y = 2x + 3$

d) (0,0); (1,2); (2,1); (2,-1); (3,0)

3) Give the domain and range for all of the relations in problem 2).

4) On the same grid, graph the following relations:

a) $y = x^2$ b) $y + 5 = x^2$ c) $y = (x - 6)^2$

5) On the same grid, graph the following relations:

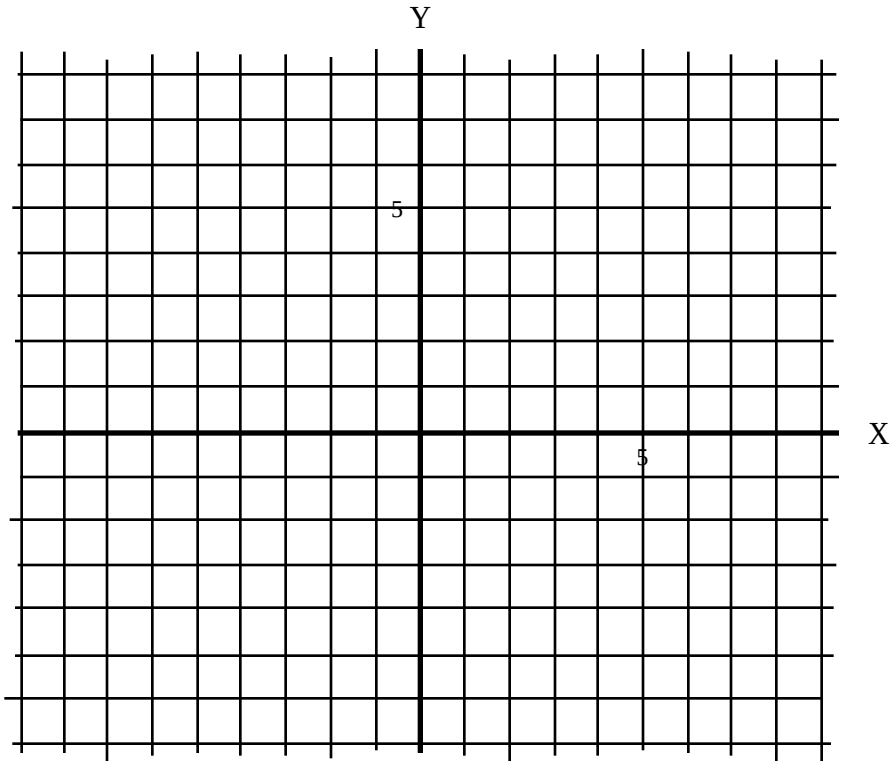
a) $y = | x |$ b) $y = | x + 4 |$ c) $y + 5 = | x - 2 |$

6) On the same grid, graph the following relations:

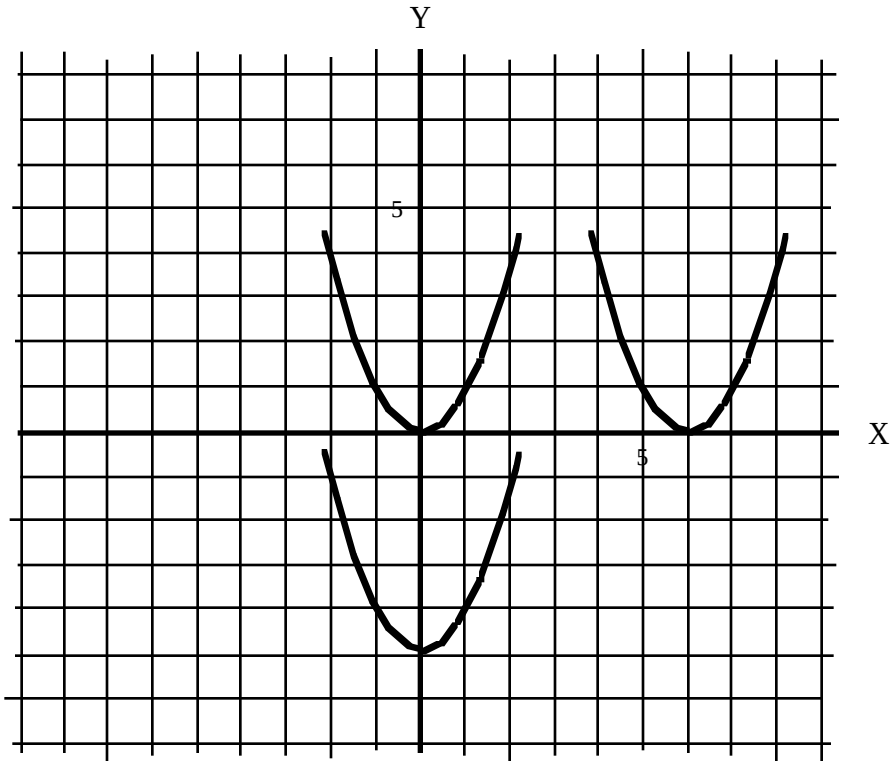
a) $y = \sqrt{x}$ b) $y - 3 = \sqrt{x}$ c) $y - 2 = \sqrt{(x + 6)}$

7) Graph each relation and give the domain and range.

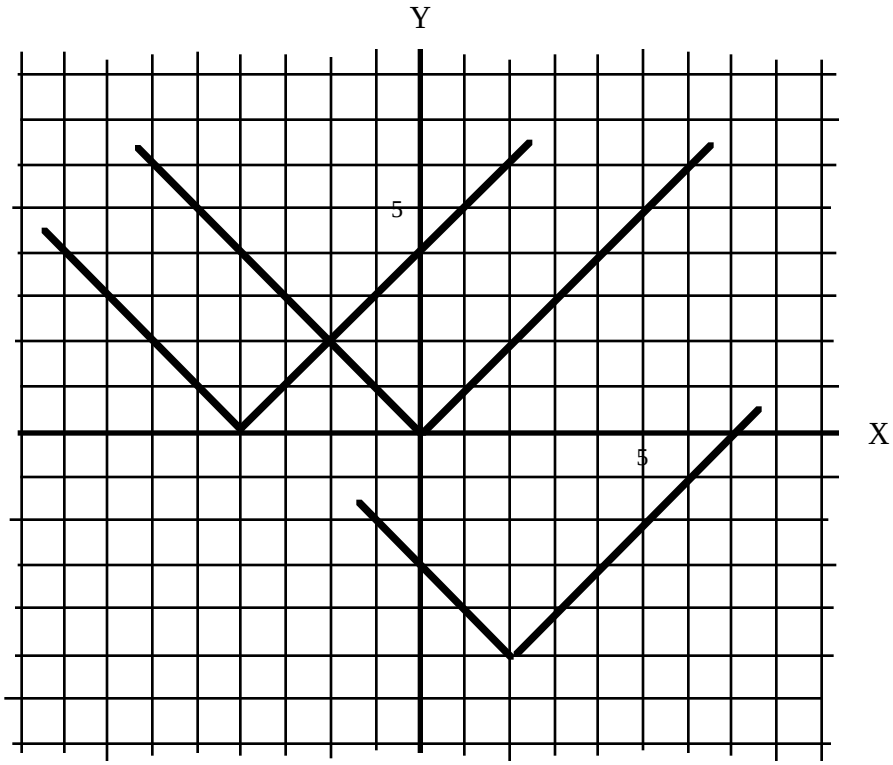
a) $y + 5 = | x + 2 |$ b) $y - 1 = \sqrt{(x + 3)}$



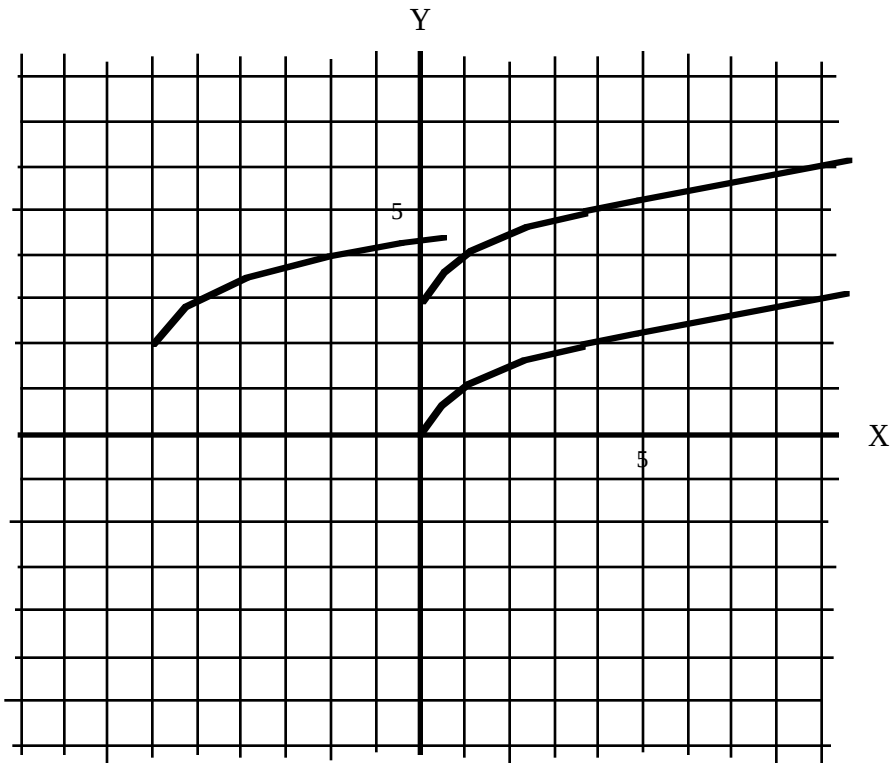
Answers: 1)a) It is a set of ordered pairs., b) It is the set of x-values of a relation., c) It is the set of y-values of a relation., d) It is a relation in which each x-value is assigned only one y-value., 2)a) function, b) not function, c) function, d) not function, 3)a) D {-3,-2,-1,0,1,2}, R {0,1,2}, b) D { $x \geq 0$ }, R { y = Reals }, c) D { Reals }, R { Reals }, d) D { 0,1,2,3 }, R { -1,0,1,2 }, 4)



5)



6)



7) a) x = { Reals }, y ≥ -5, b) x ≥ -3, y ≥ 1.