

5.4 Functions

Math 10

Functions

Relations are sets of ordered pairs. There are no restrictions on the input/output values. Relations can be divided into two categories: functions and non-functions.

Examples of **non-functions**:

repeat of x-values/input \therefore non-function

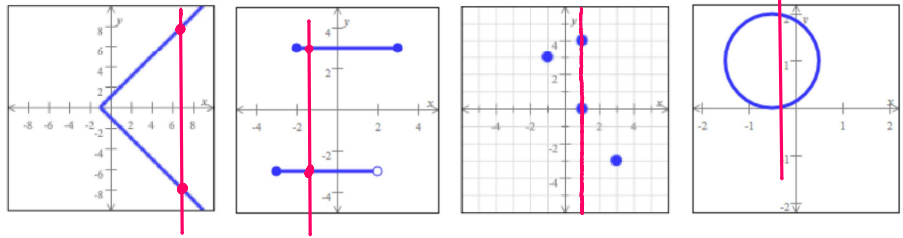
Set of ordered pairs: $\{(-8, 2), (-3, -1), (-3, 2), (4, 0)\}$

Table of Values:

x	y
-1	1
2	4
4	7
4	10

↑
repeating values
 \therefore non-function

Graphs:



These graphs all fail the vertical line test.

If a relation has exactly one y-value (output) for every x-value (input), then it is called a **function**.

Examples of **functions**:

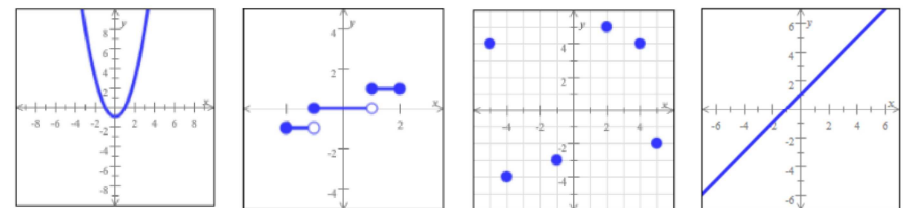
Set of ordered pairs: $\{(-8, 2), (-3, -1), (0, 7), (6, -4), (10, 5)\}$ - x-values/inputs are all different
 \therefore function

Table of Values:

x	y
-1	1
2	4
3	7
6	4

↑
all different
 \therefore function

Graphs:



These graphs all pass the vertical line test.

Vertical Line Test

The vertical line test is used to see if a graph represents a function. If any vertical line intersects the graph at more than one point, the relation is not a function.

Function Notation

Functions can be written using function notation. The function $y = 4x + 1$ is written as $f(x) = 4x + 1$. The name of the function is f , with a variable name of x . In this example, $4x + 1$ is the rule that assigns a unique value to y for each value of x . It takes any input value for x , multiplies it by 4, and adds 1 to give the result. $f(x)$ is read as “ f of x ” or “ f at x ”.

$f(2) = 4(2) + 1 = 9$. This result tells us that when $x = 2$, the value of the function is 9. The point $(2, 9)$ is on the graph of the function.

Example: The function $F(C) = 1.8C + 32$ is used to convert a temperature in degrees Celsius to degrees Fahrenheit.

a) Determine $F(25)$. What does your answer mean?

$$\begin{aligned} F(25) &= 1.8(25) + 32 \\ &= 45 + 32 \\ &= 77 \end{aligned}$$

25°C and 77°F are the same temperature.

b) Determine C so that $F(C) = 100$.

$$\begin{aligned} 100 &= 1.8C + 32 \\ -32 & \quad -32 \\ \hline 68 &= 1.8C \\ \frac{68}{1.8} &= \frac{1.8C}{1.8} \\ 37.\bar{7} &= C \end{aligned}$$

100°F and 37.8°C are the same temperature.

Example: Write the relation $y = 3x - 1$ in function notation using f for the name of the function.

$$f(x) = 3x - 1$$

Determine the output when the input is 12.

Determine $f(12)$. $= x$

$$\begin{aligned} f(12) &= 3(12) - 1 \\ &= 36 - 1 \\ &= 35 \end{aligned}$$

← The output is 35.

Determine the value of x if $f(x) = 53$.

$$53 = 3x - 1$$

$$\frac{54}{3} = \frac{3x}{3}$$

$$18 = x \rightarrow f(18) = 53$$

Assignment: p.128 #1, 2, 4 – 7