

Lesson 4 Functional Notation

Functional notation is a special way to designate relations that are functions. For example, the graph of the relation $y = -x + 2$, will be an oblique line.

Will it pass the vertical line test? *yes*



This means it is a function.

The symbol for this function is: $f(x) = -x + 2$ ← functional notation

As you can see, the symbol $f(x)$ has replaced the letter y .

The symbol $f(x)$ is read as: f of x and means the value of the function at x is the y -value.

Independent Variable – a variable whose value is not determined by the value of another variable
x-coordinates → on the x-axis of a graph

Dependent Variable – a variable whose value is determined by the value of another variable (the independent variable)
i.e. depends on the value of x
y-coordinates → on the y-axis of a graph

Example 1

The table shows the masses, m grams, of different numbers of identical marbles, n .

Number of Marbles, n	Mass of Marbles, m (g)
1	1.27
2	2.54
3	3.81
4	5.08
5	6.35
6	7.62

a) Explain why this relation is also a function.

Each number of marbles has exactly one mass (no repetition of n)

b) Identify the independent variable and the dependent variable. Justify the choices.

of marbles

mass of marbles

The mass depends on the # of marbles.

c) State the domain and range.

$D: \{1, 2, 3, 4, 5, 6\}$

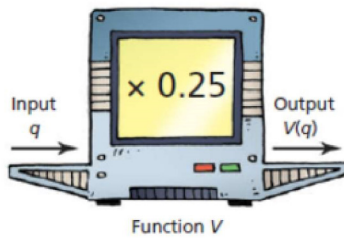
$R: \{1.27, 2.54, 3.81, 5.08, 6.35, 7.62\}$

RF L4 Functional Notation.notebook

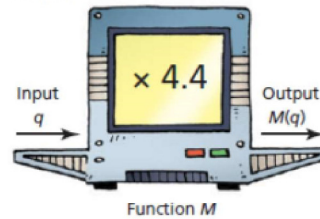
Intro Applied & Pre-Calculus 10 Relations & Functions

We can think of a function as an input/output machine. Machine A calculates the value of the quarters. Machine B weighs the quarters.

Machine A



Machine B



The input is q quarters, the output or value V is $0.25q$.

Since V is a function of q , we can write this equation using functional notation:

$$V(q) = 0.25q$$

V is the dependent variable, and V depends on q .

$V(3)$ represents the value of the function when $q = 3$.

$$V(3) = 0.25(3)$$

$$V(3) = 0.75$$

So, the value of 3 quarters is \$0.75

The input is q quarters, the output or mass M in grams is $4.4q$.

Since M is a function of q , we can write this equation using functional notation:

$$M(q) = 4.4q$$

M is the dependent variable, and M depends on q .

Example 1

Write in functional notation:

a) $d = 4t + 5$

$$d(t) = 4t + 5$$

b) $y = 3x - 2$

$$f(x) = 3x - 2$$

* y is always replaced with $f(x)$

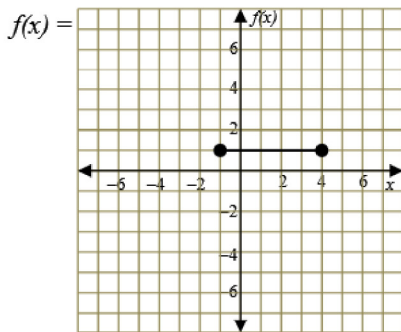
Example 2

The equation $V = -0.08d + 50$ represents the volume, V litres, of gas remaining in a vehicle's tank after travelling d kilometers. The gas tank is not refilled until it is empty.

- a) Describe the function. Write the equation in function notation.
The volume of gas depends on the kilometers driven.
 $V(d) = -0.08d + 50$
- b) Determine the value of $V(600)$. Explain what this value represents.
 $V(600) = -0.08(600) + 50 = 2 \text{ L}$
There are 2 L of gas remaining in the tank after driving 600 kms.
- c) Determine the value of d when $V(d) = 26$. Explain what this value represents.
 $V(d) = -0.08d + 50$
 $26 = -0.08d + 50$
 $-24 = -0.08d$
 $\frac{-24}{-0.08} = \frac{-0.08d}{-0.08}$
 $300 = d$
After 300 km, 26 L of gas remains

Example 3

Given the following four functions:

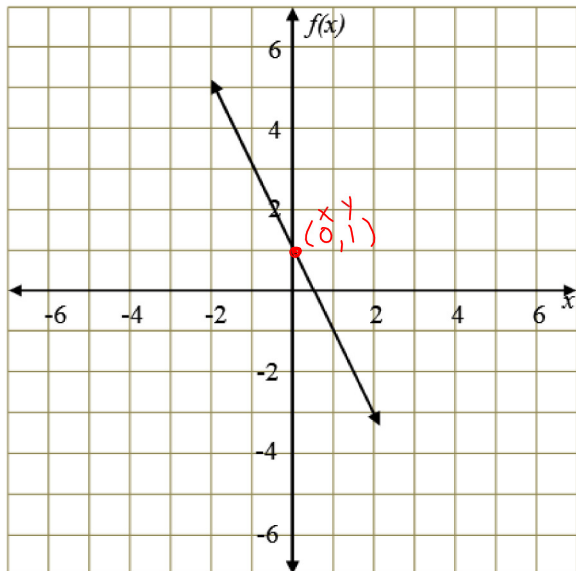


- $g(x) = \{(1, 1), (2, 2), (3, 3)\}$
- $h(x) = \{(x, h(x)) \mid h(x) = 2x - 3\}$
- $j(x) = \{(x, j(x)) \mid j(x) = x^2 + 3\}$

Determine:

- a) $f(3) = 1$
given x → determine y
- b) $g(2) = 2$
- c) $h(0) = 2(0) - 3 = -3$
- d) $h(-2) = 2(-2) - 3 = -7$
- e) $j(3) = 3^2 + 3 = 12$
- f) $j(-3) = (-3)^2 + 3 = 12$
- g) $g(4) = \emptyset$ (does not exist)
- h) $j(a) = a^2 + 3$

Example 4



Given the graph of the function,

$$f(x) = -2x + 1,$$

- a) determine the ^Yrange value when the domain value is 0.

^x
when x is 0, y is 1
from graph
or $f(0) = -2(0) + 1$

- b) determine the ^xdomain value when the range is 0.

^y
 $f(x) = -2x + 1$
 $0 = -2x + 1$
 $-1 = -2x$
 $\frac{1}{2} = x$

Assignment: Pg. 270; 6, 7, 14, 15, 16
Pg. 296; 16, 17