Gr 10 Functions

22 July 2020

The concept of a function, where a certain quantity (output value) uniquely depends on another quantity (input value). Work with relationships between variables using tables, graphs, words, and formulae. Convert flexibly between these representations.

Work through the following examples

Example 1
Complete the following tables and identify the function.

a)

x	1	2	3	4	5	6
y	5	10		20		

Solution:

x	1	2	3	4	5	6
y	5	10	15	20	25	30

$$y = 5x$$

b)

x	1		3	4		6
y	5	5			5	5

Solution:

x	1	2	3	4	5	6
y	5	5	5	5	5	5

$$y = 5$$

c)

x	2			8	10	12
y	1	2	3			6

Solution:

x	2	4	6	8	10	12
y	1	2	3	4	5	6

$$y = \frac{1}{2}x$$

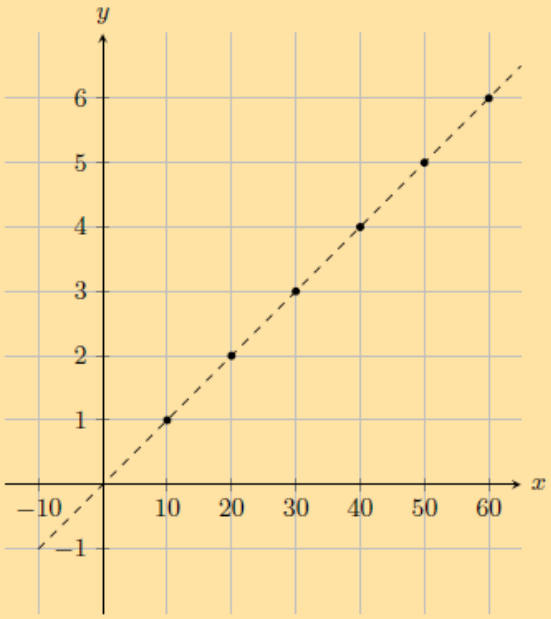
Example 2

Plot the following points on a graph.

a)

x	1	2	3	4	5	6
y	0,1	0,2	0,3	0,4	0,5	0,6

Solution:



Note that this graph is scaled. Each value for x and y has been multiplied by 10. This process does not change the function, but it stretches the graph, thereby making it easier to read.

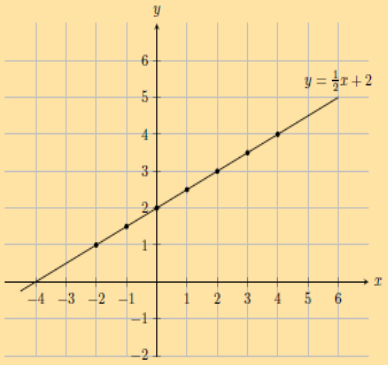
Example 3

Create a table of values from the function given and then plot the function. Your table must have at least 5 ordered pairs.

a) $y = \frac{1}{2}x + 2$

Solution:

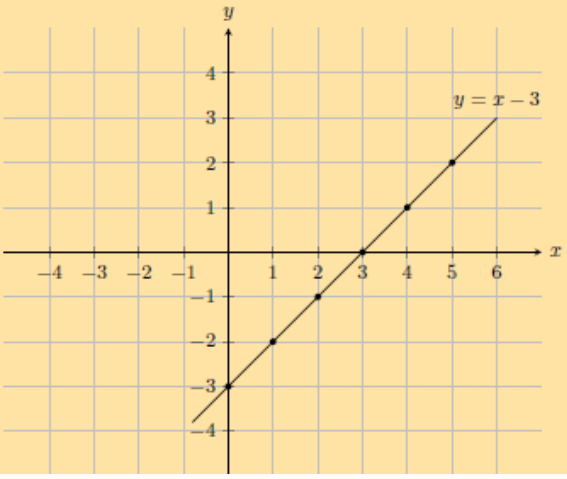
x	-2	-1	0	1	2	3	4
y	1	1,5	2	2,5	3	3,5	4



b) $y = x - 3$

Solution:

x	0	1	2	3	4	5
y	-3	-2	-1	0	1	2



Example 4

If the functions $f(x) = x^2 + 1$; $g(x) = x - 4$; $h(x) = 7 - x^2$; $k(x) = 3$ are given, find the value of the following:

a) $f(-1)$

Solution:

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

b) $g(-7)$

Solution:

$$g(x) = x - 4$$
$$g(-7) = (-7) - 4$$
$$= -11$$

c) $h(3)$

Solution:

$$h(x) = 7 - x^2$$
$$h(3) = 7 - (3)^2$$
$$= -2$$

d) $k(100)$

Solution:

$$k(x) = 3$$
$$k(100) = 3$$

Regardless of the value of x, the output is always 3.

e) $f(-2) + h(2)$

Solution:

$$f(x) + h(x) = x^2 + 1 + 7 - x^2$$
$$f(-2) + h(2) = (-2)^2 + 1 + 7 - (2)^2$$
$$= 8$$

f) $k(-5) + h(3)$

Solution:

$$k(x) + h(x) = 3 + 7 - x^2$$
$$k(-5) + h(3) = 3 + 7 - (3)^2$$
$$= 1$$

g) $f(g(1))$

Solution:

$$g(x) = x - 4$$
$$g(1) = (1) - 4$$
$$= -3$$
$$\therefore f(g(1)) = f(-3)$$
$$f(x) = x^2 + 1$$
$$= (-3)^2 + 1$$
$$= 10$$

Example 5

The cost of petrol and diesel per litre are given by the functions P and D, where:

$$P = 13{,}61V$$
$$D = 12{,}46V$$

Use this information to answer the following:

a) Evaluate $P(8)$
Solution:

$$P(8) = 13{,}61(8)$$
$$= \text{R } 108{,}88$$

b) Evaluate $D(16)$
Solution:

$$D(16) = 12{,}46(16)$$
$$= \text{R } 199{,}36$$

c) How many litres of petrol can you buy with R 300?
Solution:

$$P(V) = 300$$
$$13{,}61V = 300$$
$$V = 22{,}043 \text{ L}$$

d) How many litres of petrol can you buy with R 275?
Solution:

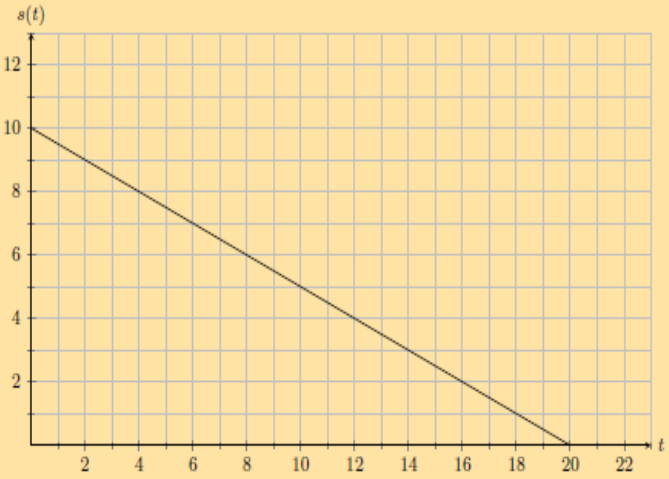
$$D(V) = 275$$
$$12{,}46V = 275$$
$$V = 22{,}071 \text{ L}$$

e) How much more expensive is petrol than diesel? Show you answer as a function.
Solution:

$$\begin{aligned} P(V) - D(V) &= 13{,}61V - 12{,}46V \\ &= 1{,}15V \end{aligned}$$

Example 6

A ball is rolling down a 10 m slope. The graph below shows the relationship between the distance and the time.



Use this information to answer the following:

a) After 6 s how much further does the ball have to roll?
Solution:
7 m

b) What is the range of the function?
Solution:
$0 \text{ m} \leq s(t) \leq 10 \text{ m}$

c) What is the domain of the function, and what does it represent?
Solution:
The domain is $0 \text{ s} \leq t \leq 20 \text{ s}$. It represents the total time taken to reach the bottom of the slope.