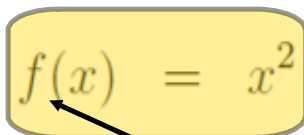


## Using Function Notation:

When a function is represented algebraically, we are given the rule as it applies to some variable. This is called functional notation. To compute the rule applied to any input we simply replace the variable with the input.

$$\begin{aligned}\text{Given: } f(x) &= x^2 \text{ then} \\ f(5) &= (5)^2 = 25 \\ f(-1) &= (-1)^2 = 1 \\ f(a+b) &= (a+b)^2 = a^2 + 2ab + b^2 \\ f(2y) &= (2y)^2 = 4y^2\end{aligned}$$

**IMPORTANT!!**


$$f(x) = x^2$$

This does NOT mean  
 $f$  multiplied by  $x$

- Given  $f(x) = x^2 + 2x - 1$ , find  $f(2)$ .

$$\begin{aligned} f(2) &= (2)^2 + 2(2) - 1 \\ &= 4 + 4 - 1 \\ &= 7 \end{aligned}$$

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

$$f(w+r) = (w+r)^2 + 2(w+r) - 1$$

- Given  $f(x) = x^2 + 2x - 1$ , find  $f(-3)$ .

$$\begin{aligned} f(-3) &= (-3)^2 + 2(-3) - 1 \\ &= 9 - 6 - 1 \\ &= 2 \end{aligned}$$

Given:  $f(x) = -2 + 7x$  and  $w(x) = x^2 - 7x + 3$

Find: (a)  $f(w(-1))$

$$\begin{aligned} w(-1) &= (-1)^2 - 7(-1) + 3 \\ &= 1 + 7 + 3 \\ &= 11 \end{aligned}$$

$$\begin{aligned} f(11) &= -2 + 7(11) \\ &= -2 + 77 \\ &= 75 \end{aligned}$$

$$f\{f[w(w(-1))]\}$$

$$\begin{aligned} w(1) &= (1)^2 - 7(1) + 3 \\ &= -3 \end{aligned}$$

$$\begin{aligned} w(-3) &= (-3)^2 - 7(-3) + 3 \\ &= 9 + 21 + 3 \\ &= 33 \end{aligned}$$

$$\begin{aligned} f(33) &= -2 + 7(33) \\ &= 229 \end{aligned}$$

$$\begin{aligned} f(229) &= -2 + 7(229) \\ &= 1601 \end{aligned}$$

(b)  $w[f(w(0))]$

$$\begin{aligned} w(0) &= (0)^2 - 7(0) + 3 \\ &= 3 \end{aligned}$$

$$\begin{aligned} f(3) &= -2 + 7(3) \\ &= 19 \end{aligned}$$

$$\begin{aligned} w(19) &= (19)^2 - 7(19) + 3 \\ &= 231 \end{aligned}$$

- Given that  $f(x) = 3x^2 + 2x$ , find  $f(h)$ .
- Given that  $f(x) = 3x^2 + 2x$ , find  $f(x + h)$ .

$$f(h) = 3h^2 + 2h$$

$$f(x+h) = 3(x+h)^2 + 2(x+h)$$

$$= 3(x^2 + 2xh + h^2) + 2x + 2h$$

$$= 3x^2 + 6xh + 3h^2 + 2x + 2h$$

- Given that  $f(x) = 3x^2 + 2x$ , find  $f(x + h) - f(h)$ .

$$f(x+h) - f(h) = (3x^2 + 6xh + \cancel{3h^2} + 2x + \cancel{2h}) - (\cancel{3h^2} + \cancel{2h})$$

$$= 3x^2 + 6xh + 2x$$

$$f(x) = 5x^2 - x + 7$$

Find  $f(x+h) - f(x)$

$$\begin{aligned} f(x+h) &= 5(x+h)^2 - (x+h) + 7 \\ &= 5(x^2 + 2xh + h^2) - x - h + 7 \end{aligned}$$

$$\therefore = 5x^2 + 10xh + 5h^2 - x - h + 7$$

$$\begin{aligned} f(x+h) - f(x) &= (\cancel{5x^2} + 10xh + \cancel{5h^2} - \cancel{x} - \cancel{h} + \cancel{7}) - (\cancel{5x^2} - \cancel{x} + \cancel{7}) \\ &= 10xh + 5h^2 - h \end{aligned}$$

**Example 3****Using Function Notation to Determine Values**

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

- a) Describe the function.

Write the equation in function notation.

$$V(d) = -0.08d + 50$$

- b) Determine the value of  $V(600)$ .

What does this number represent?

- c) Determine the value of  $d$  when  $V(d) = 26$ .

What does this number represent?

Practice problems...

Pages 270 - 271

#4, 5, 6, 7, 8, 9, 14, 15, 17, 18, 19, 20