2.3) Functions

Worked example	Your turn
If $f(x) = x^2 + 3$, evaluate: $f(4)$ $f(-2)$	If $h(x) = x^2 + 4$, evaluate: $h(5)$ 29
If $g(x) = x^3 - 5$, evaluate: $g(4)$ $g(-2)$	$h(-2)$ 8

Worked example

$$f(x) = 4x - 8, x \in \mathbb{R}$$
$$g(x) = x^2 - 4, x \in \mathbb{R}$$

Find:

a) $f(-2)$

b) $g(0)$

c) The value of x for which $f(x) = g(x)$

Your turn

$$f(x) = 2x - 10, x \in \mathbb{R}$$
$$g(x) = x^2 - 9, x \in \mathbb{R}$$

Find:

a) $f(5)$

b) $g(10)$

c) The value of x for which $f(x) = g(x)$

a) 0

b) 91

c) $x = 1$

Worked example

Determine the minimum/maximum value of the function and state the value of x for which this minimum occurs:

$$f(x) = x^2 + 8x + 17$$

$$g(x) = x^2 - 8x + 17$$

$$h(x) = 17 - x^2$$

$$i(x) = 17 - 8x - x^2$$

Your turn

Determine the minimum/maximum value of the function and state the value of x for which this minimum occurs:

$$f(x) = x^2 + 6x + 10$$

Minimum of 19 when $x = -3$

$$g(x) = x^2 - 6x + 10$$

Minimum of 1 when $x = 3$

$$h(x) = 10 - x^2$$

Maximum of 10 when $x = 0$

$$i(x) = 10 - 6x - x^2$$

Maximum of 19 when $x = -3$

Worked example

$$f(x) = 4x - 8, x \in \mathbb{R}$$
$$g(x) = x^2 - 4, x \in \mathbb{R}$$

Find:

a) $f(-2)$

b) $g(0)$

c) The value of x for which $f(x) = g(x)$

Your turn

$$f(x) = 2x - 10, x \in \mathbb{R}$$
$$g(x) = x^2 - 9, x \in \mathbb{R}$$

Find:

a) $f(5)$

b) $g(10)$

c) The value of x for which $f(x) = g(x)$

a) 0

b) 91

c) $x = 1$

Worked example

$$f(x) = 5x + 4$$

Find:

$f(x + 3)$

$f(x - 4)$

$f(5x)$

$f(\frac{1}{6}x)$

Your turn

$$g(x) = 3x + 2$$

Find:

$g(x + 2)$

$3x + 8$

$g(x - 2)$

$3x + 4$

$g(2x)$

$6x + 2$

$g(\frac{1}{2}x)$

$\frac{3}{2}x + 2$

Worked example	Your turn
$f(x) = 3x^2 - 2$	$g(x) = 5x^2 + 3$
$f(x+2)$	$g(x+4)$
	$5(x+4)^2 + 3$ $= 5x^2 + 40x + 83$
$f(x-2)$	$f(x-4)$
	$5(x-4)^2 + 3$ $= 5x^2 - 40x + 83$
$f(2x)$	$g(3x)$
	$5(3x)^2+3$ $= 45x^2 + 3$
$f(\frac{1}{2}x)$	$g(\frac{1}{3}x)$
	$5\left(\frac{1}{3}x\right)^2 + 3$ $= \frac{5}{9}x^2 + 3$

Worked example

$f(x) = 3x^2 - 5x - 2$

$f(x+2)$

$f(x-2)$

$f(2x)$

$f(\frac{1}{2}x)$

Your turn

$g(x) = 5x^2 - 2x + 3$

$g(x+4)$

$5(x+4)^2 - 2(x+4) + 3$
$= 5x^2 + 38x + 75$

$f(x-4)$

$5(x-4)^2 - 2(x-4) + 3$
$= 5x^2 - 42x + 91$

$g(3x)$

$5(3x)^2 - 2(3x) + 3$
$= 45x^2 - 6x + 3$

$g(\frac{1}{3}x)$

$5\left(\frac{1}{3}x\right)^2 - 2\left(\frac{1}{3}x\right) + 3$
$= \frac{5}{9}x^2 - \frac{2}{3}x + 3$