

1 $f: x \rightarrow 3x - 5, x \in \mathbb{R}$ $g: x \rightarrow \frac{4}{6-x}, x \in \mathbb{R}, x \neq 6$ $h: x \rightarrow x^2 + 4x - 1, x \in \mathbb{R}$

Find the value of

a $f(3)$ **b** $g(4)$ **c** $h(2)$ **d** $f(1)$ **e** $h(-1)$ **f** $g(8)$
g $g(-4)$ **h** $f(\frac{2}{3})$ **i** $h(\frac{1}{2})$ **j** $f(-1)$ **k** $h(-3)$ **l** $g(1\frac{2}{3})$

2 $f: x \rightarrow \ln(2 - 5x), x \in \mathbb{R}, x < 0.4$ $g: x \rightarrow \sin(2x + \frac{\pi}{3}), x \in \mathbb{R}$ $h: x \rightarrow 3 + 2e^{1-x}, x \in \mathbb{R}$

Find, correct to 3 significant figures where appropriate, the value of

a $g(\frac{\pi}{3})$ **b** $f(0)$ **c** $h(1)$ **d** $g(\frac{\pi}{6})$ **e** $h(2)$ **f** $f(-\frac{1}{2})$
g $h(-0.8)$ **h** $f(0.2)$ **i** $g(0.3)$ **j** $h(\frac{2}{3})$ **k** $g(-1)$ **l** $f(-\frac{3}{4})$

3 Sketch each function and state its range.

a $f: x \rightarrow 2x + 1, x \in \mathbb{R}, 0 \leq x \leq 7$ **b** $f: x \rightarrow 3x - 2, x \in \mathbb{R}, x \geq 0$
c $f: x \rightarrow 5 - x, x \in \mathbb{R}, -5 \leq x \leq 5$ **d** $f: x \rightarrow 4 - 7x, x \in \mathbb{R}$
e $f: x \rightarrow x^2, x \in \mathbb{R}, -3 < x < 3$ **f** $f: x \rightarrow x^2 + 3, x \in \mathbb{R}$
g $f: x \rightarrow x^2 - 6, x \in \mathbb{R}, x \geq 0$ **h** $f: x \rightarrow (x - 1)^2, x \in \mathbb{R}, -2 \leq x \leq 4$
i $f: x \rightarrow (x + 2)^2, x \in \mathbb{R}$ **j** $f: x \rightarrow 4 - x^2, x \in \mathbb{R}$
k $f: x \rightarrow x^3, x \in \mathbb{R}, -10 < x \leq 10$ **l** $f: x \rightarrow -x^3, x \in \mathbb{R}$

4 Sketch each function and state its range.

a $f: x \rightarrow x^2 + 2x - 8, x \in \mathbb{R}$ **b** $f: x \rightarrow \frac{1}{x}, x \in \mathbb{R}, x \neq 0$
c $f: x \rightarrow \frac{1}{x^2}, x \in \mathbb{R}, x \neq 0$ **d** $f: x \rightarrow \cos x, x \in \mathbb{R}, 0 \leq x \leq 2\pi$
e $f: x \rightarrow 5^x, x \in \mathbb{R}$ **f** $f: x \rightarrow \tan x, x \in \mathbb{R}, -\frac{\pi}{4} \leq x \leq \frac{\pi}{4}$

5 Find the domain of each function given its range.

a $f: x \rightarrow x - 1, f(x) \in \mathbb{R}, -1 \leq f(x) < 6$ **b** $f: x \rightarrow 4 - 3x, f(x) \in \mathbb{R}, f(x) \leq 4$
c $f: x \rightarrow x^3, f(x) \in \mathbb{R}, 0 \leq f(x) \leq 125$ **d** $f: x \rightarrow \frac{1}{x}, f(x) \in \mathbb{R}, 2 < f(x) < 10$

6 Given that for $x \in \mathbb{R}$, $f(x) \equiv 4x + 3$, $g(x) \equiv x^2 - 7$ and $h(x) \equiv \frac{9}{x+2}, x \neq -2$, solve the equations

a $f(x) = 9$ **b** $g(x) = 18$ **c** $h(x) = 6$
d $f(x) = h(x)$ **e** $g(x) - \frac{1}{h(x)} = -6\frac{1}{3}$ **f** $f(x) + g(x) = 0$

7 Express each function in the form indicated and hence, state its range.

a $f: x \rightarrow x^2 + 4x + 11, x \in \mathbb{R}$ in the form $(x + a)^2 + b$
b $f: x \rightarrow x^2 - 2x - 6, x \in \mathbb{R}$ in the form $(x + a)^2 + b$
c $f: x \rightarrow 4x^2 + 12x + 3, x \in \mathbb{R}$ in the form $(ax + b)^2 + c$
d $f: x \rightarrow 9x^2 - 6x + 16, x \in \mathbb{R}$ in the form $(ax + b)^2 + c$
e $f: x \rightarrow 15 - 4x - x^2, x \in \mathbb{R}$ in the form $a - (x + b)^2$