

# C3 FUNCTIONS

## Worksheet A

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  $a - (x + b)^2$