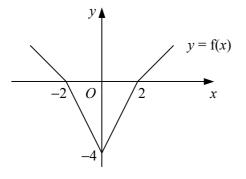
FUNCTIONS

- **1 a** Express $x^2 8x + 18$ in the form $(x + a)^2 + b$.
 - **b** Find the distance of the vertex of the curve $y = x^2 8x + 18$ from the origin, giving your answer in the form $k\sqrt{5}$.
 - **c** Describe two transformations that would map the graph of $y = x^2$ onto the graph of $y = x^2 8x + 18$.

2

C3



The diagram shows the graph of y = f(x) which meets the coordinate axes at the points (-2, 0), (0, -4) and (2, 0).

Showing the coordinates of any points of intersection with the coordinate axes, sketch on separate diagrams the graphs of

a
$$y = \frac{1}{2} |f(x)|$$
,

b
$$y = 4 + f(x + 2)$$
.

3 Sketch the curve with equation $y = 2 - 2 \sin x$ for x in the interval $0 \le x \le 2\pi$.

Label on your sketch the coordinates of any maximum or minimum points and any points where the curve meets the coordinate axes.

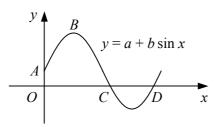
$$\mathbf{f}(x) \equiv \left| 2x + 5 \right|, \ x \in \mathbb{R}.$$

- **a** Sketch the graph y = f(x), showing the coordinates of any points where the graph meets the coordinate axes.
- **b** Evaluate ff(-4).

$$g(x) \equiv f(x+k), x \in \mathbb{R}.$$

c State the value of the constant k for which g(x) is symmetrical about the y-axis.

5



The diagram shows the curve $y = a + b \sin x$, $0 \le x \le 360^\circ$.

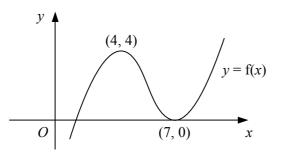
The curve meets the y-axis at the point A (0, 2) and has a maximum at the point B (90°, 7).

- **a** Find the values of the constants *a* and *b*.
- **b** Find the *x*-coordinates of the points *C* and *D*, where the curve crosses the *x*-axis.

C3 FUNCTIONS

- **a** Sketch the curve $y = 3 \cos 2x^\circ$ for x in the interval $0 \le x \le 360$.
 - **b** Write down the coordinates of the points where the curve intersects the *x*-axis.
 - c Write down the coordinates of the turning points of the curve.
- 7

6



The diagram shows the curve with equation y = f(x) which has two stationary points with coordinates (4, 4) and (7, 0).

Showing the coordinates of any stationary points, sketch on separate diagrams the curves

- **a** y = 1 + 2f(x),
- **b** y = f(-3x).
- 8 a Sketch the curve $y = \frac{1}{2} + \sin 3x$ for x in the interval $0 \le x \le 180^\circ$.
 - **b** Write down the coordinates of the turning points of the curve.
 - **c** Find the *x*-coordinates of the points where the curve crosses the *x*-axis.
- 9 The function f is defined by

$$f: x \to x^{\frac{1}{2}} - 2, x \in \mathbb{R}, x \ge 0.$$

Showing the coordinates of any points where each graph meets the coordinate axes, sketch on separate diagrams the graphs of

a
$$y = f(x)$$
,

11

b
$$y = 2 + |f(x)|$$
,

c
$$y = 3f(x+1)$$
.

10 Sketch the curve $y = 4 \sin \left(x + \frac{\pi}{3}\right)$ for x in the interval $0 \le x \le 2\pi$.

Label on your sketch

- i the value of x at each point where the curve intersects the x-axis,
- ii the coordinates of the maximum and minimum points of the curve.

2.

$$f(x) \equiv \frac{3x-5}{x-2}, \ x \in \mathbb{R}, \ x \neq$$

- **a** Find $f^{-1}(x)$ and state its domain.
- **b** Hence, or otherwise, solve the equation f(x) = 4.
- c Find the values of a and b such that

$$\mathbf{f}(x) = a + \frac{b}{x-2}.$$

d Hence, describe two transformations that map the graph of $y = \frac{1}{x}$ onto the graph of y = f(x).