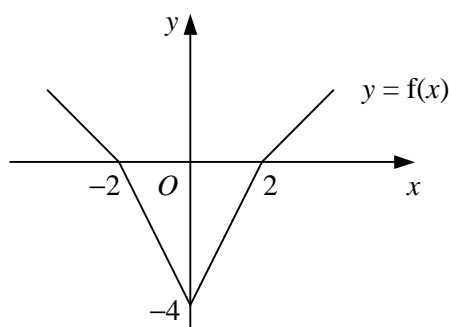


C3 FUNCTIONS

Worksheet F

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

2



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

- $y = \frac{1}{2} |f(x)|$,
 - $y = 4 + f(x + 2)$.
- 3 Sketch the curve with equation $y = 2 - 2 \sin x$ for x in the interval $0 \leq x \leq 2\pi$.
Label on your sketch the coordinates of any maximum or minimum points and any points where the curve meets the coordinate axes.

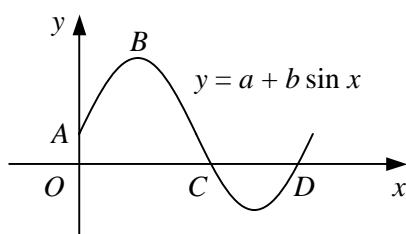
4 $f(x) \equiv |2x + 5|$, $x \in \mathbb{R}$.

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

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

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

5



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

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

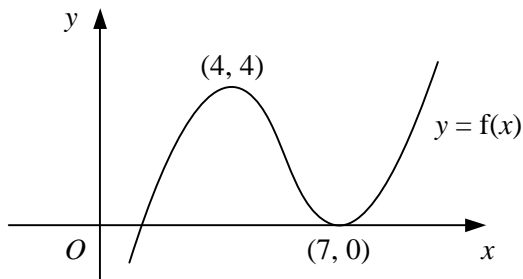
- Find the values of the constants a and b .
- Find the x -coordinates of the points C and D , where the curve crosses the x -axis.

C3 FUNCTIONS

Worksheet F continued

- 6 a Sketch the curve $y = 3 \cos 2x^\circ$ for x in the interval $0 \leq x \leq 360$.
 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



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 $0 \leq x \leq 180^\circ$.
 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

$$f: x \rightarrow x^{\frac{1}{2}} - 2, \quad x \in \mathbb{R}, \quad x \geq 0.$$

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

- a $y = f(x)$,
 b $y = 2 + |f(x)|$,
 c $y = 3f(x + 1)$.
- 10 Sketch the curve $y = 4 \sin(x + \frac{\pi}{3})$ for x in the interval $0 \leq x \leq 2\pi$.
 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.

11
$$f(x) \equiv \frac{3x-5}{x-2}, \quad x \in \mathbb{R}, \quad x \neq 2.$$

- 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

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

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