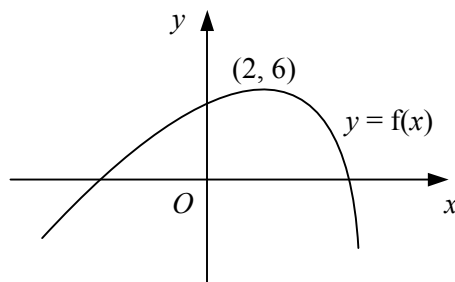


- 1 Describe how the graph of $y = f(x)$ is transformed to give the graph of
- a** $y = 2 + f(x + 3)$ **b** $y = 3f(x - 1)$ **c** $y = 4 - f(x)$ **d** $y = f(2x + 6)$
- 2 **a** Express $x^2 + 6x + 2$ in the form $a(x + b)^2 + c$.
b Hence, describe two transformations that would map the graph of $y = x^2$ onto the graph of $y = x^2 + 6x + 2$.
- 3 Each of the following graphs is translated by 3 units in the positive x -direction and then stretched by a factor of 2 in the y -direction, about the x -axis.
 Find and simplify an equation of the graph obtained in each case.
- a** $y = 2x + 7$ **b** $y = 3e^x$ **c** $y = x^2 - 3x + 1$ **d** $y = \frac{1}{x}$
- 4 Describe in order two transformations that would map the graph of
- a** $y = \ln x$ onto the graph of $y = 2 + 3 \ln x$ **b** $y = e^x$ onto the graph of $y = 5 + e^{-x}$
c $y = \frac{1}{x}$ onto the graph of $y = \frac{3}{x+4}$ **d** $y = |x|$ onto the graph of $y = |2x - 1|$

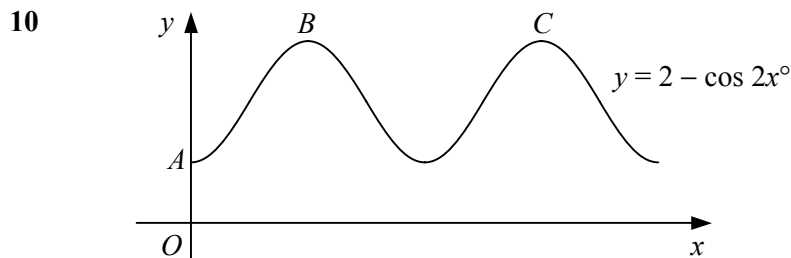
5



The diagram shows the curve with equation $y = f(x)$ which is stationary at the point $(2, 6)$.
 Showing the coordinates of the stationary point in each case, sketch on separate diagrams the graphs of

- a** $y = 1 + f(x - 4)$ **b** $y = 3 - f(x)$ **c** $y = 2f(x + 1)$ **d** $y = f(3x - 1)$
- 6 The graph of $y = x^2 + 4x - 2$ undergoes the following three transformations:
 first: translation by -2 units in the positive x -direction,
 second: stretch by a factor of 3 in the y -direction, about the x -axis,
 third: reflection in the y -axis.
 Find and simplify an equation of the graph obtained.
- 7 **a** Express $2x^2 - 4x + 7$ in the form $a(x + b)^2 + c$.
b Hence, describe in order a sequence of transformations that would map the graph of $y = 2x^2 - 4x + 7$ onto the graph of $y = x^2$.
- 8
$$f(x) \equiv x^3 - 3x^2 + 4, \quad x \in \mathbb{R}.$$
- a** Find the coordinates of the stationary points on the graph of $y = f(x)$.
b Hence, find the coordinates of the stationary points on each of the following graphs.
- i** $y = -2f(x)$ **ii** $y = 3 + f(\frac{1}{2}x)$ **iii** $y = f(2 - x)$

- 9 a Describe clearly, in order, the sequence of transformations that would map the graph of $y = \sqrt{x}$ onto the graph of $y = 2 - 3\sqrt{x}$.
- b Sketch the graph of $y = 2 - 3\sqrt{x}$ showing the coordinates of any points where the graph meets the coordinate axes.



The diagram shows part of the curve with equation $y = 2 - \cos 2x^\circ$, $x > 0$.

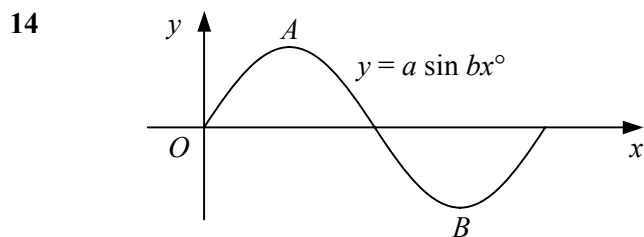
- a State the period of the curve.
- b Write down the coordinates of the point A where the curve meets the y-axis.
- c Write down the coordinates of B and C, the first two maximum points on the curve.
- 11 Sketch each of the following curves for x in the interval $0 \leq x \leq 360$. Show the coordinates of any turning points and the equations of any asymptotes.
- | | | |
|-------------------------------------|-----------------------------------|------------------------------|
| a $y = 3 \cos 2x^\circ$ | b $y = \tan (-2x^\circ)$ | c $y = 1 + 2 \sin x^\circ$ |
| d $y = -\sin (x + 60)^\circ$ | e $y = 2 \cos (x - 45)^\circ$ | f $y = 3 - \tan x^\circ$ |
| g $y = 2 + \cos \frac{1}{2}x^\circ$ | h $y = 4 \sin \frac{3}{2}x^\circ$ | i $y = \cos (2x - 60)^\circ$ |

- 12 State the period of the curves with the equations

- a $y = 2 \tan 3x^\circ$,
- b $y = 1 + \sin kx^\circ$, giving your answer in terms of k .

- 13 $f(x) \equiv 2 \sin \frac{1}{2}x$, $0 \leq x \leq 2\pi$.

- a Sketch the graph $y = f(x)$.
- b State the coordinates of the maximum point of the curve.
- c Solve the equation $f(x) = \sqrt{2}$, giving your answers in terms of π .



The graph shows the curve $y = a \sin bx^\circ$, $0 \leq x \leq 180$.

The curve has a maximum at the point A with coordinates (45, 4).

- a Find the values of the constants a and b .
- b Write down the coordinates of the minimum point of the curve, B.