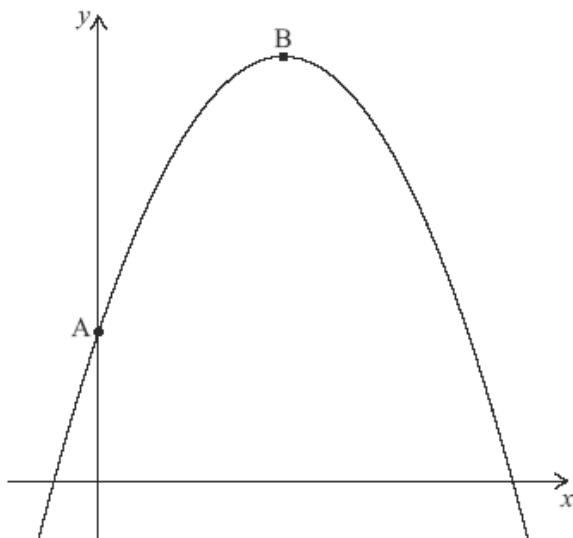1. The graph of the quadratic function $f(x) = 3 + 4x - x^2$ intersects the y-axis at point A and has its vertex at point B.
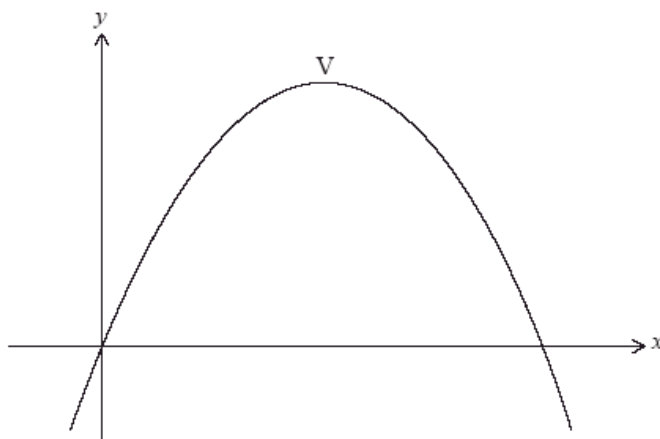

(a)   Find the coordinates of B.

(3)

Another point, C, which lies on the graph of $y = f(x)$ has the same y-coordinate as A.

(b)   (i)   Plot and label C on the graph above.

(ii)   Find the x-coordinate of C.

(3)
(Total 6 marks)

2.   A quadratic curve with equation $y = ax(x - b)$ is shown in the following diagram.

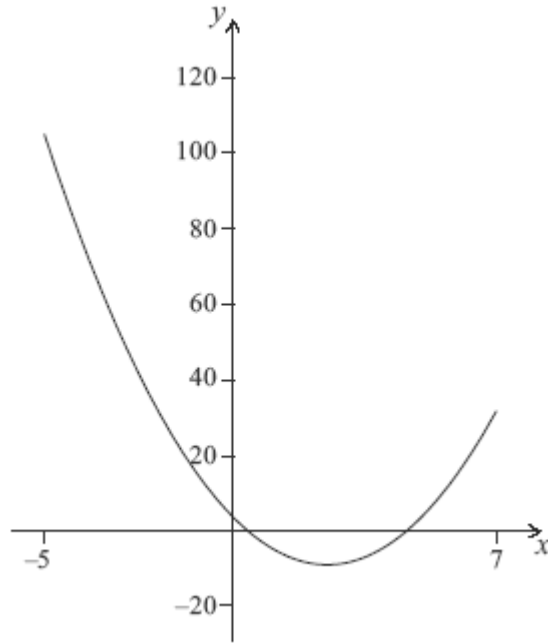The x-intercepts are at $(0, 0)$ and $(6, 0)$, and the vertex V is at $(h , 8)$.

(a)   Find the value of h.

(2)

(b)   Find the equation of the curve.

(4)
(Total 6 marks)

3. The graph of $y = 2x^2 - rx + q$ is shown for $-5 \leq x \leq 7$.

The graph cuts the y-axis at $(0, 4)$.

(a) Write down the value of q.

(1)

The axis of symmetry is $x = 2.5$.

(b) Find the value of r.

(2)

(c) Write down the minimum value of y.

(1)

(d) Write down the range of y.

(2)
(Total 6 marks)

4. Consider the function $f(x) = 2x^3 - 5x^2 + 3x + 1$.

(a) Find $f'(x)$.

(3)

(b) Write down the value of $f'(2)$.

(1)

(c) Find the equation of the tangent to the curve of $y = f(x)$ at the point (2, 3).

(2)

(Total 6 marks)

5. Consider $f : x \mapsto x^2 - 4$.

(a) Find $f'(x)$.

(1)

Let L be the line with equation $y = 3x + 2$.

(b) Write down the gradient of a line parallel to L.

(1)

(c) Let P be a point on the curve of f. At P, the tangent to the curve is parallel to L. Find the coordinates of P.

(4)

(Total 6 marks)

6. The straight line, L, has equation $2y - 27x - 9 = 0$.

(a) Find the gradient of L.

(2)

Sarah wishes to draw the tangent to $f(x) = x^4$ parallel to L.

(b) Write down $f'(x)$.

(1)

(c) (i) Find the x-coordinate of the point at which the tangent must be drawn.

(ii) Write down the value of $f(x)$ at this point.

(3)

(Total 6 marks)

7. The function $f(x)$ is such that $f'(x) < 0$ for $1 < x < 4$. At the point P (4, 2) on the graph of $f(x)$ the gradient is zero.

    (a)   Write down the equation of the tangent to the graph of $f(x)$ at P.

                                                                                              (2)

    (b)   State whether $f(4)$ is greater than, equal to or less than $f(2)$.

                                                                                             (2)

    (c)   Given that $f(x)$ is increasing for $4 \le x < 7$, what can you say about the point P?

                                                                                             (2)
                                                      (Total 6 marks)

8. The table given below describes the behaviour of $f'(x)$, the derivative function of $f(x)$, in the domain $-4 < x < 2$.

x	$f'(x)$
$-4 < x < -2$	< 0
-2	0
$-2 < x < 1$	> 0
1	0
$1 < x < 2$	> 0

    (a)   State whether $f(0)$ is greater than, less than or equal to $f(-2)$. Give a reason for your answer.

                                                                                             (2)

    The point P$(-2, 3)$ lies on the graph of $f(x)$.

    (b)   Write down the equation of the tangent to the graph of $f(x)$ at the point P.

                                                                                          (2)

    (c)   From the information given about $f'(x)$, state whether the point $(-2, 3)$ is a maximum, a minimum or neither. Give a reason for your answer.

                                                                                             (2)
                                                      (Total 6 marks)