

Full marks are not necessarily awarded for a correct answer with no working. Answers must be supported by working and/or explanations. Where an answer is incorrect, some marks may be given for a correct method, provided this is shown by written working. You are therefore advised to show all working.

Section A

Answer **all** questions in the boxes provided. Working may be continued below the lines if necessary.

1. [Maximum mark: 5]

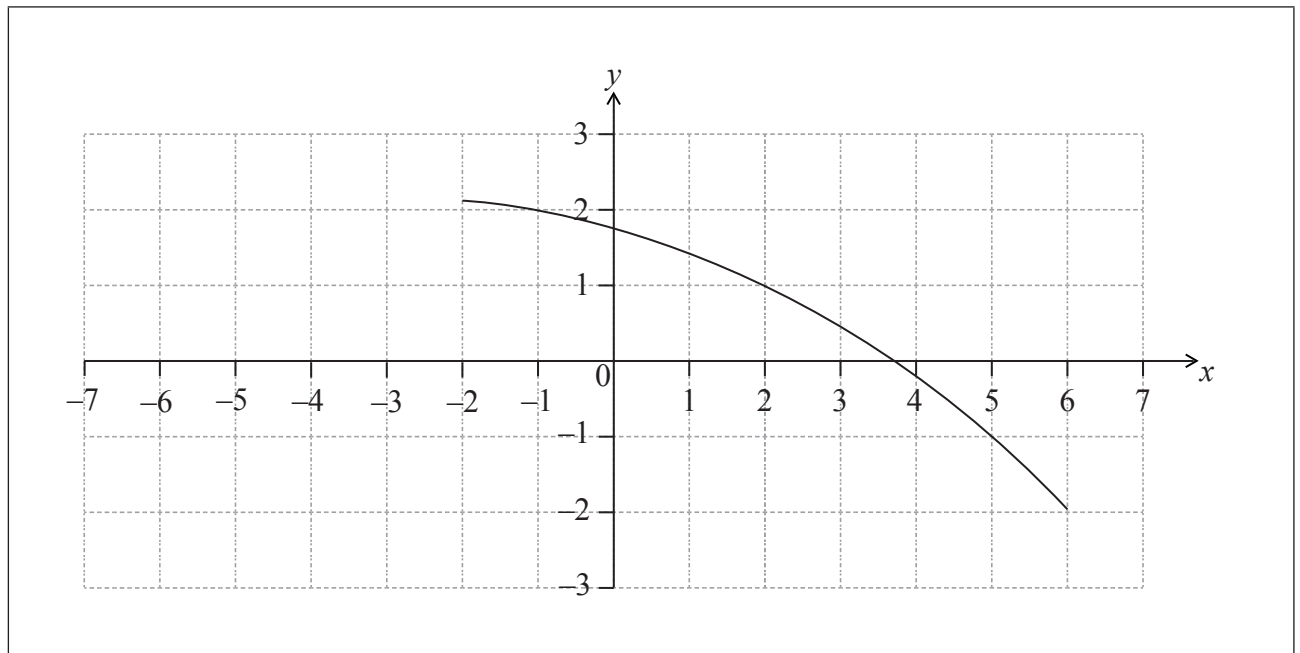
Let $f(x) = 8x + 3$ and $g(x) = 4x$, for $x \in \mathbb{R}$.

- (a) Write down $g(2)$. [1]
- (b) Find $(f \circ g)(x)$. [2]
- (c) Find $f^{-1}(x)$. [2]



4. [Maximum mark: 7]

The following diagram shows the graph of a function f .



- (a) Find $f^{-1}(-1)$. [2]
- (b) Find $(f \circ f)(-1)$. [3]
- (c) On the same diagram, sketch the graph of $y = f(-x)$. [2]

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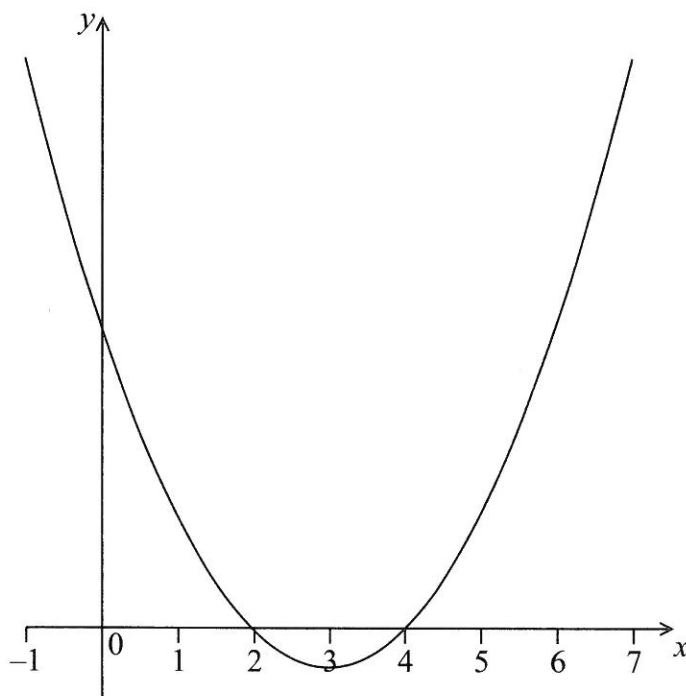
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Section A

Answer **all** questions in the boxes provided. Working may be continued below the lines if necessary.

1. [Maximum mark: 6]

The following diagram shows part of the graph of a quadratic function f .



The vertex is at $(3, -1)$ and the x -intercepts at 2 and 4.

The function f can be written in the form $f(x) = (x - h)^2 + k$.

(a) Write down the value of h and of k . [2]

The function can also be written in the form $f(x) = (x - a)(x - b)$.

(b) Write down the value of a and of b . [2]

(c) Find the y -intercept. [2]

(This question continues on the following page)



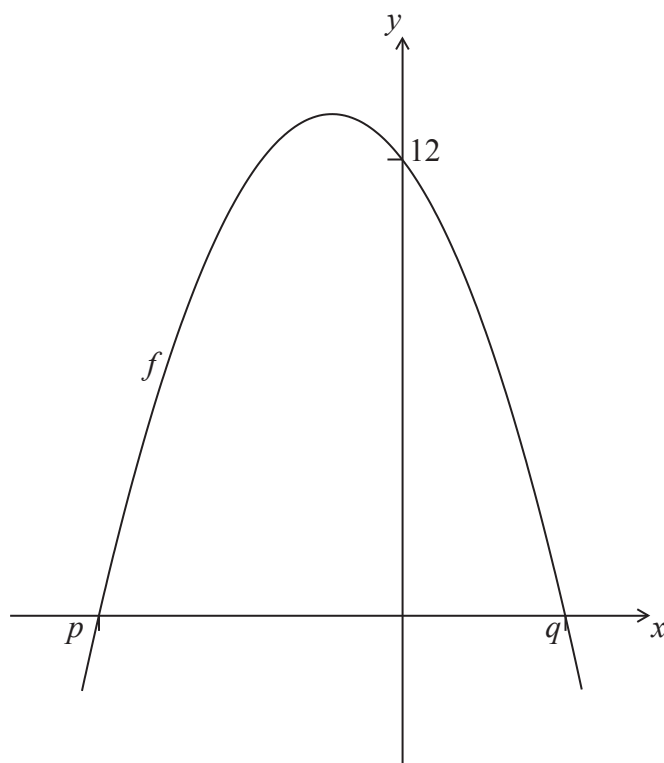
Do **not** write solutions on this page.

Section B

Answer **all** questions in the answer booklet provided. Please start each question on a new page.

8. [Maximum mark: 15]

Let $f(x) = a(x + 3)(x - 1)$. The following diagram shows part of the graph of f .



The graph has x -intercepts at $(p, 0)$ and $(q, 0)$, and a y -intercept at $(0, 12)$.

(a) (i) Write down the value of p and of q .

(ii) Find the value of a .

[6]

(b) Find the equation of the axis of symmetry of the graph of f .

[3]

(c) Find the largest value of f .

[3]

The function f can also be written as $f(x) = a(x - h)^2 + k$.

(d) Find the value of h and of k .

[3]



5. [Maximum mark: 6]

Consider $f(x) = x^2 + qx + r$. The graph of f has a minimum value when $x = -1.5$.
The distance between the two zeros of f is 9.

(a) Show that the two zeros are 3 and -6 . [2]

(b) Find the value of q and of r . [4]

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7. [Maximum mark: 8]

Let $f(x) = kx^2 + kx$ and $g(x) = x - 0.8$. The graphs of f and g intersect at two distinct points. Find the possible values of k .

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6. [Maximum mark: 6]

Let $f(x) = px^2 + (10 - p)x + \frac{5}{4}p - 5$.

(a) Show that the discriminant of $f(x)$ is $100 - 4p^2$. [3]

(b) Find the values of p so that $f(x) = 0$ has two **equal** roots. [3]

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