

## Quadratic Functions Review Paper 2

1. Let  $f(x) = 2x^2 + 4x - 6$ .

(a) Express  $f(x)$  in the form  $f(x) = 2(x - h)^2 + k$ . (3)

(b) Write down the equation of the axis of symmetry of the graph of  $f$ . (1)

(c) Express  $f(x)$  in the form  $f(x) = 2(x - p)(x - q)$ . (2)

(Total 6 marks)

2. Let  $f(x) = 3x^2$ . The graph of  $f$  is translated 1 unit to the right and 2 units down. The graph of  $g$  is the image of the graph of  $f$  after this translation.

(a) Write down the coordinates of the vertex of the graph of  $g$ . (2)

(b) Express  $g$  in the form  $g(x) = 3(x - p)^2 + q$ . (2)

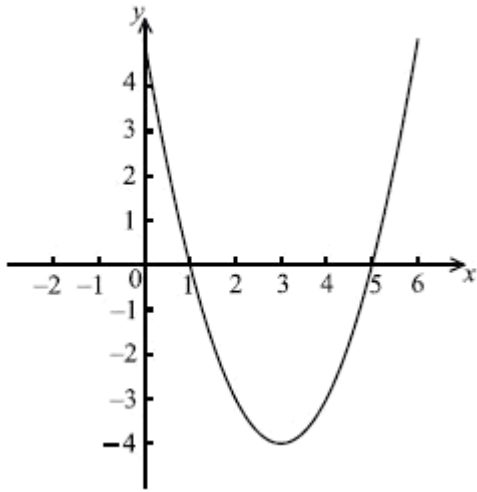
The graph of  $h$  is the reflection of the graph of  $g$  in the  $x$ -axis.

(c) Write down the coordinates of the vertex of the graph of  $h$ . (2)

(Total 6 marks)

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3. The following diagram shows part of the graph of a quadratic function, with equation in the form  $y = (x - p)(x - q)$ , where  $p, q \in \mathbb{R}$ .



- (a) Write down
- (i) the value of  $p$  and of  $q$ ;
  - (ii) the equation of the axis of symmetry of the curve.
- (3)
- (b) Find the equation of the function in the form  $y = (x - h)^2 + k$ , where  $h, k \in \mathbb{R}$ .
- (3)

**(Total 6 marks)**

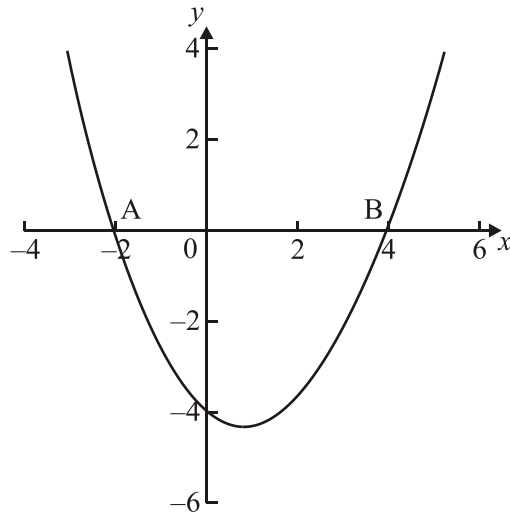
4. The quadratic equation  $kx^2 + (k - 3)x + 1 = 0$  has two equal real roots.

- (a) Find the possible values of  $k$ .
- (5)
- (b) **Write down** the values of  $k$  for which  $x^2 + (k - 3)x + k = 0$  has two equal real roots.
- (2)

**(Total 7 marks)**

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5. The equation of a curve may be written in the form  $y = a(x - p)(x - q)$ . The curve intersects the  $x$ -axis at  $A(-2, 0)$  and  $B(4, 0)$ . The curve of  $y = f(x)$  is shown in the diagram below.



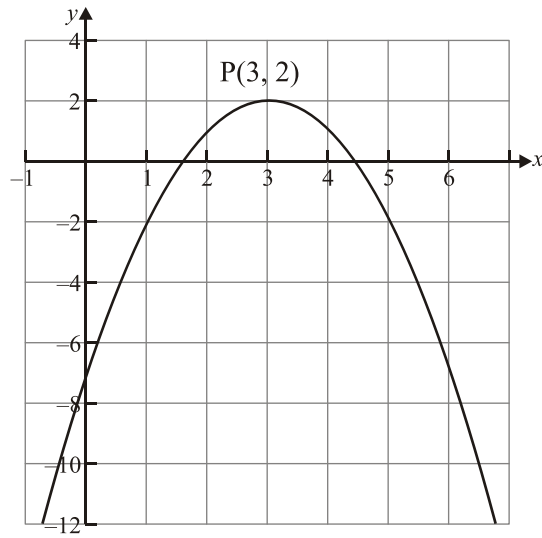
- (a) (i) Write down the value of  $p$  and of  $q$ .
- (ii) Given that the point  $(6, 8)$  is on the curve, find the value of  $a$ .
- (iii) Write the equation of the curve in the form  $y = ax^2 + bx + c$ .

(5)

(Total 5 marks)

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6. The function  $f(x)$  is defined as  $f(x) = -(x - h)^2 + k$ . The diagram below shows part of the graph of  $f(x)$ . The maximum point on the curve is P (3, 2).



- (a) Write down the value of

(i)  $h$ ;

(ii)  $k$ .

(2)

- (b) Show that  $f(x)$  can be written as  $f(x) = -x^2 + 6x - 7$ .

(1)

(Total 3 marks)

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7. A ball is thrown vertically upwards into the air. The height,  $h$  metres, of the ball above the ground after  $t$  seconds is given by

$$h = 2 + 20t - 5t^2, t \geq 0$$

- (a) Find the **initial** height above the ground of the ball (that is, its height at the instant when it is released). (2)
- (b) Show that the height of the ball after one second is 17 metres. (2)
- (c) At a later time the ball is **again** at a height of 17 metres.
- (i) Write down an equation that  $t$  must satisfy when the ball is at a height of 17 metres.
- (ii) Solve the equation **algebraically**. (4)
- (d) (i) Find **when** the ball reaches its maximum height.
- (ii) Find the maximum height of the ball.

(2)  
(Total 10 marks)

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8. A homebuilder wants to build a rectangular deck on the back of a house. One side of the deck will share a wall with the house and the other three sides will have a wooden railing. The side parallel to the house will have a decorative railing that costs \$10 per meter. The other two sides will have regular railing which costs \$4 per meter. If the homebuilder wants the area of the deck to be  $320 \text{ m}^2$ , what is the minimum cost for the deck?

**\*\*Other Application Problems\*\*** - Use any of the problems from Oxford, Haese and Harris or Cirrito