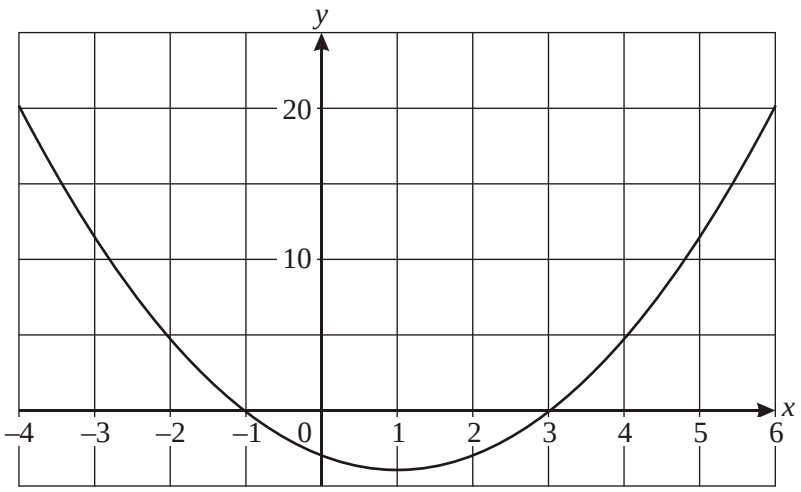
1. The graph of $y = x^2 - 2x - 3$ is shown on the axes below.



(a) Draw the graph of $y = 5$ on the same axes.

(b) Use your graph to find:

(i) the values of x when $x^2 - 2x - 3 = 5$

(ii) the value of x that gives the minimum value of $x^2 - 2x - 3$

Working:

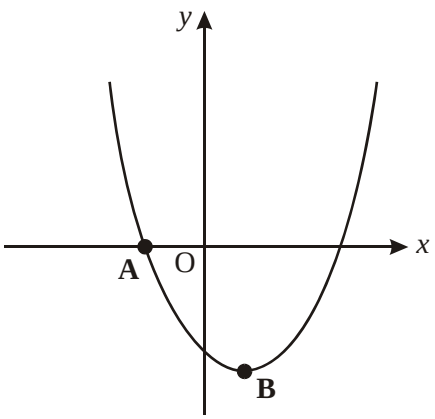
Answers:

(b) (i) ……...

(ii) ……..

(Total 4 marks)

2. The diagram shows the graph of $y = x^2 - 2x - 8$. The graph crosses the x-axis at the point A, and has a vertex at B.



(a) Factorize $x^2 - 2x - 8$.

(b) Write down the coordinates of each of these points

(i) A;

(ii) B.

Working:

Answers:

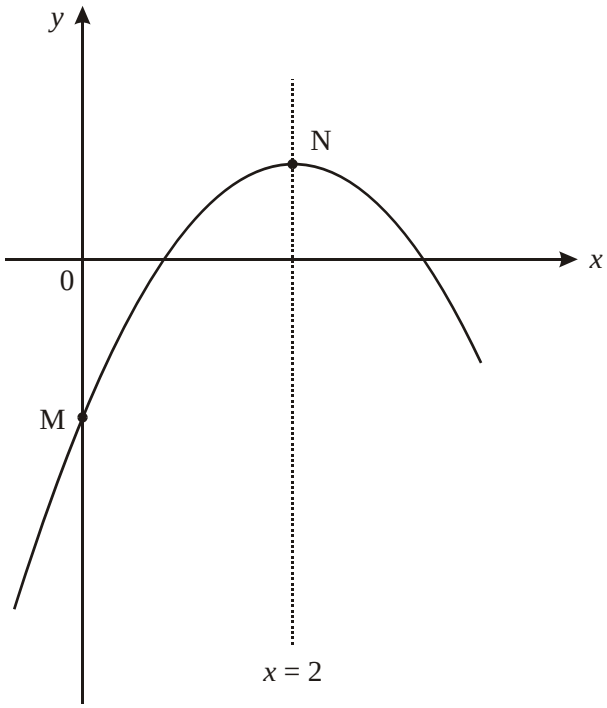
(a) ……..

(b) (i) ……..

(ii) ……..

(Total 4 marks)

3. The diagram below shows part of the graph of $y = ax^2 + 4x - 3$. The line $x = 2$ is the axis of symmetry. M and N are points on the curve, as shown.



(a) Find the value of a.

(b) Find the coordinates of

(i) M;

(ii) N.

Working:

Answers:

(a) .....

(b) (i) ……...

(ii) ……...

(Total 4 marks)

4. A rectangle has dimensions $(5 + 2x)$ metres and $(7 – 2x)$ metres.

(a) Show that the area, A, of the rectangle can be written as $A = 35 + 4x – 4x^2$.

(1)

(b) The following is the table of values for the function $A = 35 + 4x – 4x^2$.

x	–3	–2	–1	0	1	2	3	4
A	–13	p	27	35	q	r	11	s

(i) Calculate the values of p, q, r and s.

(ii) On graph paper, using a scale of 1 cm for 1 unit on the x-axis and 1 cm for 5 units on the A-axis, plot the points from your table and join them up to form a smooth curve.

(6)

(c) Answer the following, using your graph or otherwise.

(i) Write down the equation of the axis of symmetry of the curve,

(ii) Find one value of x for a rectangle whose area is 27 m^2.

(iii) Using this value of x, write down the dimensions of the rectangle.

(4)

(d) (i) On the same graph, draw the line with equation $A = 5x + 30$.

(ii) Hence or otherwise, solve the equation $4x^2 + x - 5 = 0$.

(3)
(Total 14 marks)

5. Consider the graphs of the following functions.

(i) $y = 7x + x^2$;

(ii) $y = (x - 2)(x + 3)$;

(iii) $y = 3x^2 - 2x + 5$;

(iv) $y = 5 - 3x - 2x^2$.

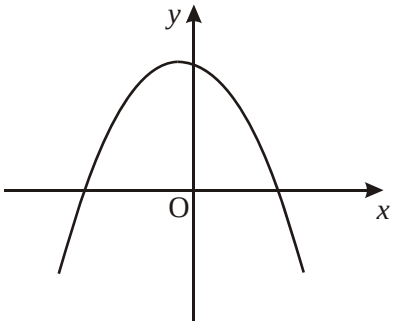
Which of these graphs

(a) has a y-intercept below the x-axis?

(b) passes through the origin?

(c) does not cross the x-axis?

(d) could be represented by the following diagram?



Working:

Answers:

(a) .....

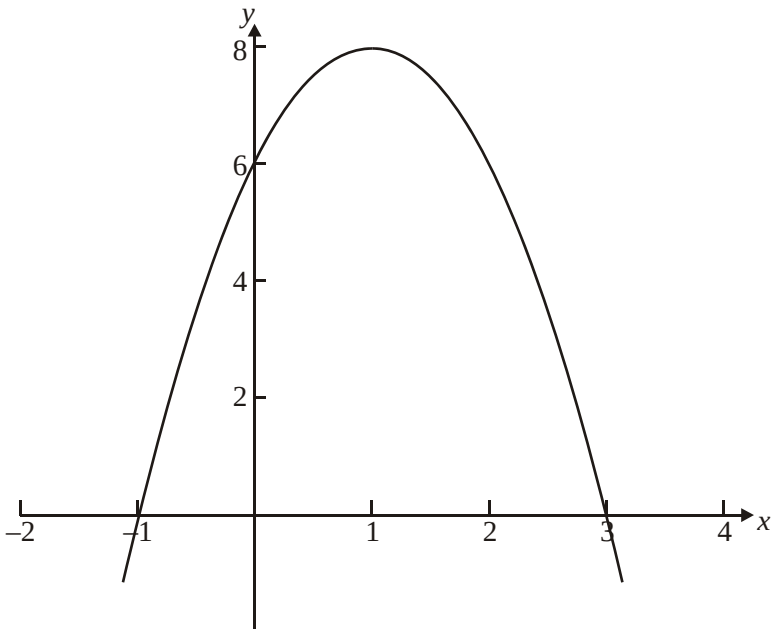
(b) .....

(c) .....

(d) .....

(Total 8 marks)

6. The figure below shows part of the graph of a quadratic function $y = ax^2 + 4x + c$.



(a) Write down the value of c.

(b) Find the value of a.

(c) Write the quadratic function in its factorized form.

Working:

Answers:

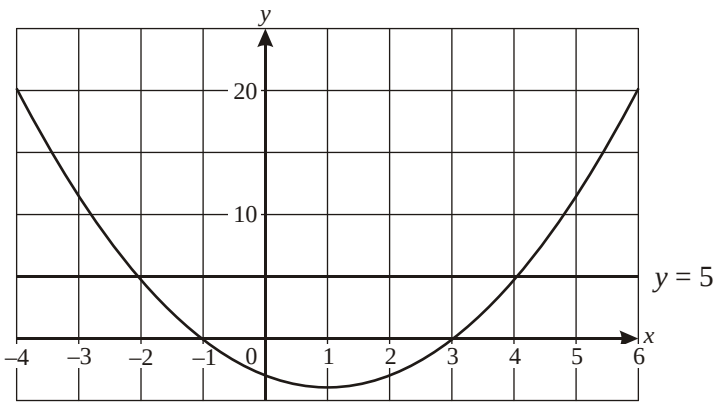
(a) .....

(b) .....

(c) .....

(Total 8 marks)

1. (a)



(A1) (C1)

Note: *The equation* y = 5 *is not required*

(b) (i) $x = -2$ (A1)

$x = 4$ (A1) (C2)

(ii) $x = 1$ (A1) (C1)

Note: *Allow follow through from candidate's graph*

[4]

2. (a) $(x + 2)(x - 4)$ (A1)

(b) (i) $(-2, 0)$ (A1)

(ii) $(1, -9)$ (A1)(A1)

[4]

3. (a) $x = -\dfrac{b}{2a}$

$2 = -\dfrac{4}{2 \times a}$ (M1)

$a = -1$ (A1)

(b) ***Note:*** *Answers to (b) must be written as coordinates.*

(i) M(0, –3) (A1)

(ii) $y = 1 \times 2^2 + 4 \times 2 - 3$

$= 1$

N is (2,1) (A1)

[4]

4. (a) $A = (5 + 2x)(7 – 2x)$ (M1)

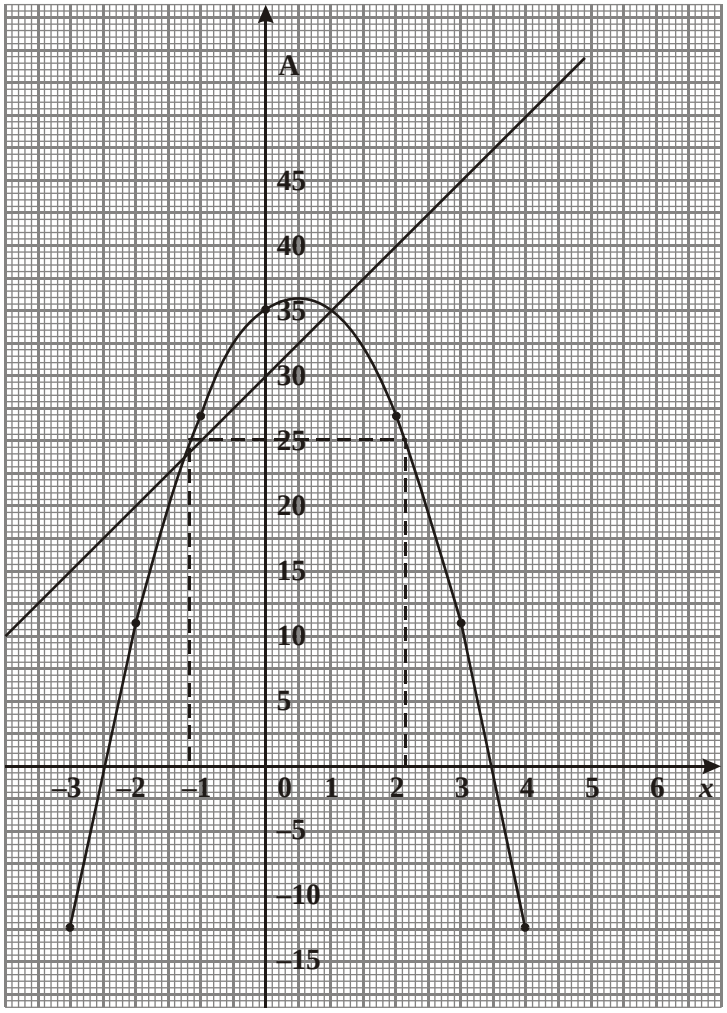
$= 35 – 10x + 14x – 4x^2$

$= 35 + 4x – 4x^2$ (AG) 1

(b) (i) $p = 11$, $q = 35$, $r = 27$, $s = –13$ (A2)

Note: *Award (A2) for all four correct, (A1) for two or three correct.*

(ii)



(A4) 6

Notes: *Award (A1) for axes with correct scales and labelling.*
Award (A2) for 6, 7 or 8 points correctly plotted,
(A1) for 3, 4, or 5 points,
(A0) for 2 or fewer.
Award (A1) for a smooth curve through reasonably correct points.

(c) (i) Axis of symmetry is $x = \frac{1}{2}$ (A1)

(ii) $A = 27 \Rightarrow x = -1$ or $x = 2$ (A1)

Note: *Award (A1) for one correct value of x.*

(iii) $x = -1$, rectangle is $(5 - 2) \times (7 + 2)$ (M1)
i.e. 3×9 (A1)

OR

$x = 2$, rectangle is $(5 + 4) \times (7 - 4)$ (M1)
i.e. 9×3 (A1) 4

Notes: *Award (A2) for the correct answer.*
Follow through with answers for x from the candidate's graph.

(d) (i) Line on graph. (A1)

(ii) From graph solutions are $x = 1$ and $x = -1.3$ (± 0.1) (A2)
(Follow through with candidate's graph of parabola and straight line.)

OR

Factorizing gives $(x - 1)(4x + 5) = 0$ (M1)
$\Rightarrow x = 1$ or $x = -1.25$ (A1) 3
[14]

5. (a) (ii) (A2) (C2)

(b) (i) (A2)(C2)

(c) (iii) (A2)(C2)

(d) (iv) (A2)(C2)
[8]

6. (a) At $x = 0$ we have $y = 6 = c$, (M1)
so $c = 6$. (A1) (C2)

(b) At $x = 3$ we have $9a + 12 + c = 0$ (M2)
$a = -2$ (A1)

OR

at $x = -1$ we have $a - 4 + c = 0$ (M2)
$a = -2$ (A1) (C3)

(c) Factorisation is $y = -2(x - 3)(x + 1)$ (A1)(A1)(A1)

OR

can include 2 and/or sign in a factor. (A1)(A2)

[8]