FOUNDATION & HIGHER

HIGHER EXTENDS

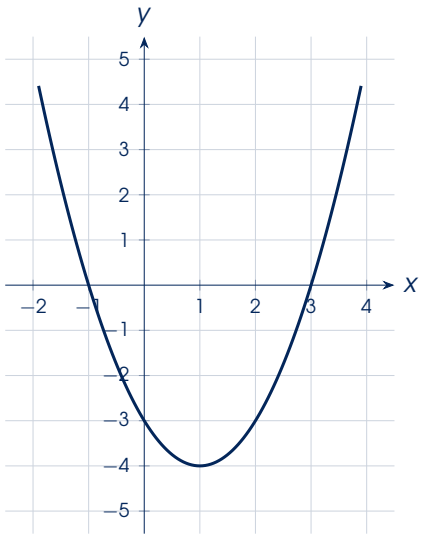
Name ..... Class .....

A11: Quadratic graphs

Roots, intercepts and turning points; completing the square

20 marks · 25 minutes · Non-calculator

1) This is the graph of $y = x^2 - 2x - 3$



(a) Write down the roots of $x^2 - 2x - 3 = 0$

.....

(1)

(b) State the coordinates of the y-intercept.

.....

(1)

(c) State the coordinates of the turning point.

.....

(1)

[Question 1: 3 marks]

2) (a) Write $x^2 + 6x + 4$ in the form $(x + a)^2 + b$

.....

(2)

(b) Hence write down the coordinates of the turning point of $y = x^2 + 6x + 4$

.....

(1)

[Question 2: 3 marks]

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3) By factorising, find the roots of $y = x^2 - x - 12$

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[Question 3: 2 marks]

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4) Find the coordinates of the turning point of $y = 2x^2 - 12x + 7$

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[Question 4: 2 marks]

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5) (a) Write $x^2 - 10x + 18$ in the form $(x + a)^2 + b$

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(2)

(b) Hence state the turning point of $y = x^2 - 10x + 18$

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(1)

[Question 5: 3 marks]

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6) Find the roots of $y = 2x^2 + 5x - 3$

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[Question 6: 2 marks]

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7) For the graph of $y = (x - 2)^2 + 4$:

(a) State the coordinates of the turning point.

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(1)

(b) Is the turning point a maximum or a minimum?

.....

(1)

(c) Where does the graph cross the y-axis?

.....

(1)

[Question 7: 3 marks]

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8) By completing the square, explain why $y = x^2 + 6x + 10$ has no real roots.

[Question 8: 2 marks]

End of paper – 20 marks in total

Answers and brief mark scheme

Q	Answer	Method / notes
1	(a) -1 and 3 (b) $(0, -3)$ (c) $(1, -4)$	B1 each.
2	(a) $(x + 3)^2 - 5$ (b) $(-3, -5)$	(a) $(x + 3)^2$ (M1); A1. (b) B1 ft.
3	$x = 4,\ x = -3$	$(x - 4)(x + 3)$ (M1); A1.
4	$(3, -11)$	$2(x - 3)^2 - 11$ or $2[(x - 3)^2 - 9] + 7$ (M1); A1.
5	(a) $(x - 5)^2 - 7$ (b) $(5, -7)$	(a) $(x - 5)^2$ (M1); A1. (b) B1 ft.
6	$x = \frac{1}{2},\ x = -3$	$(2x - 1)(x + 3)$ (M1); A1.
7	(a) $(2, 4)$ (b) minimum (c) $(0, 8)$	B1 each.
8	$(x + 3)^2 + 1$	$(x + 3)^2 + 1$ (M1); it is always at least 1, so never 0 (A1).