Quadratics Review KEY

0 min
0 marks

1. (a) $x^2 - 3x - 10 = (x - 5)(x + 2)$ (M1)(A1) (C2)

(b) $x^2 - 3x - 10 = 0 \Rightarrow (x - 5)(x + 2) = 0$ (M1)

$\Rightarrow x = 5$ or $x = -2$ (A1) (C2)

[4]

2. $(7 - x)(1 + x) = 0$ (M1)

$\Leftrightarrow x = 7$ or $x = -1$ (A1)(C1)(C1)

B: $x = \dfrac{7 + -1}{2} = 3$; (A1)

$y = (7 - 3)(1 + 3) = 16$ (A1) (C2)

[4]

3. Discriminant $\Delta = b^2 - 4ac$ $(= (-2k)^2 - 4)$ (A1)

$\Delta > 0$ (M2)

Note: *Award (M1)(M0) for* $\Delta \geq 0$.

$(2k)^2 - 4 > 0 \Rightarrow 4k^2 - 4 > 0$

EITHER

$4k^2 > 4$ $(k^2 > 1)$ (A1)

OR

$4(k - 1)(k + 1) > 0$ (A1)

OR

$(2k - 2)(2k + 2) > 0$ (A1)

THEN

$k < -1$ or $k > 1$ (A1)(A1) (C6)

Note: *Award (A1) for* $-1 < k < 1$.

[6]

4. (a) evidence of attempting to solve $f(x) = 0$ (M1)

evidence of correct working A1

eg $(x+1)(x-2), \dfrac{1 \pm \sqrt{9}}{2}$

intercepts are $(-1, 0)$ and $(2, 0)$ (accept $x = -1$, $x = 2$) A1A1 N1N1

(b) evidence of appropriate method (M1)

eg $x_v = \dfrac{x_1 + x_2}{2}$, $x_v = -\dfrac{b}{2a}$, reference to symmetry

$x_v = 0.5$ A1 N2

[6]

5. (a) $f(x) = 3(x^2 + 2x + 1) - 12$ A1

$= 3x^2 + 6x + 3 - 12$ A1

$= 3x^2 + 6x - 9$ AG N0

(b) (i) vertex is $(-1, -12)$ A1A1 N2

(ii) $x = -1$ (**must** be an equation) A1 N1

(iii) $(0, -9)$ A1 N1

(iv) evidence of solving $f(x) = 0$ (M1)

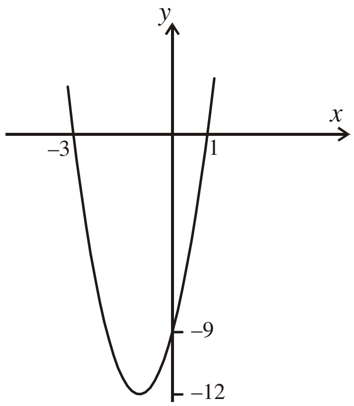
eg factorizing, formula,

correct working A1

eg $3(x + 3)(x - 1) = 0$, $x = \dfrac{-6 \pm \sqrt{36 + 108}}{6}$

$(-3, 0)$, $(1, 0)$ A1A1 N1N1

(c)



A1A1 N2

Notes: *Award A1 for a parabola opening upward, A1 for vertex and intercepts in approximately correct positions.*

(d) $\begin{pmatrix} p \\ q \end{pmatrix} = \begin{pmatrix} -1 \\ -12 \end{pmatrix}$, $t = 3$ (accept $p = -1$, $q = -12$, $t = 3$) A1A1A1 N3

[15]

6. (a) For attempting to complete the square or expanding $y = 2(x - c)^2 + d$, or for showing the vertex is at (3, 5) M1

$y = 2(x - 3)^2 + 5$ (accept $c = 3$, $d = 5$) A1A1 N2

(b) (i) $k = 2$ A1 N1

(ii) $p = 3$ A1 N1

(iii) $q = 5$ A1 N1

[6]

7. (a) (i) $m = 3$ A2 N2

(ii) $p = 2$ A2 N2

(b) Appropriate substitution M1

eg $0 = d(1-3)^2 + 2$, $0 = d(5-3)^2 + 2$, $2 = d(3-1)(3-5)$

$d = -\frac{1}{2}$ A1 N1

[6]

8. (a) **METHOD 1**

Using the discriminant = 0 ($q^2 - 4(4)(25) = 0$) M1

$q^2 = 400$

$q = 20$, $q = -20$ A1A1 N2

METHOD 2

Using factorizing:
$(2x-5)(2x-5)$ and/or $(2x+5)(2x+5)$ M1

$q = 20$, $q = -20$ A1A1 N2

(b) $x = 2.5$ A1 N1

(c) (0, 25) A1A1 N2

[6]

[6]

9. (a) Vertex is (4, 8) A1A1 N2

(b) Substituting $-10 = a(7-4)^2 + 8$ M1

$a = -2$ A1 N1

(c) For y-intercept, $x = 0$ (A1)

$y = -24$ A1 N2

[6]

10. (a) $p = -1$ and $q = 3$ (or $p = 3$, $q = -1$) (A1)(A1) (C2)

(accept $(x + 1)(x - 3)$)

(b) **EITHER**

by symmetry (M1)

OR

differentiating $\frac{dy}{dx} = 2x - 2 = 0$ (M1)

OR

Completing the square (M1)

$x^2 + 2x - 3 = x^2 - 2x + 1 - 4 = (x - 1)^2 - 4$

THEN

$x = 1$, $y = -4$ (so C is $(1, -4)$) (A1)(A1)(C2)(C1)

(c) -3 (A1) (C1)

(accept $(0, -3)$)

[6]

11. One solution $\Rightarrow$ discriminant = 0 (M2)

$3^2 - 4k = 0$ (A2)

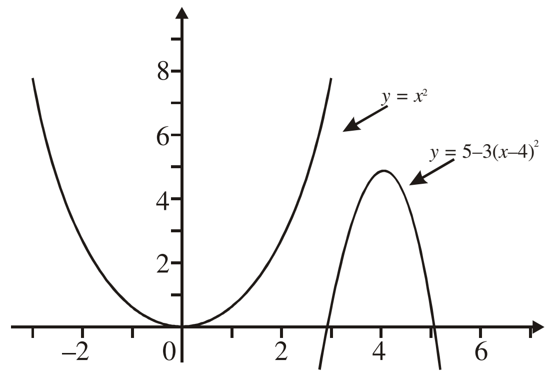
$9 = 4k$

$k = \frac{9}{4}\left(= 2\frac{1}{4}, 2.25\right)$ (A2) (C6)

Note: *If candidates correctly solve an incorrect equation, award M2 A0 A2(ft), if they have the first line or equivalent, otherwise award no marks.*

[6]

12.



$q = 5$ (A1) (C1)
$k = 3$, $p = 4$ (A3) (C3)

[4]

13. (a) $f(x) = x^2 - 6x + 14$
$f(x) = x^2 - 6x + 9 - 9 + 14$ (M1)
$f(x) = (x - 3)^2 + 5$ (M1)

(b) Vertex is (3, 5) (A1)(A1)

[4]

14. $y = (x + 2)(x - 3)$ (M1)
$= x^2 - x - 6$ (A1)
Therefore, $0 = 4 - 2p + q$ (A1)(A1)(C2)(C2)

OR

$y = x^2 - x - 6$ (C3)

OR

$0 = 4 - 2p + q$ (A1)
$0 = 9 + 3p + q$ (A1)
$p = -1$, $q = -6$ (A1)(A1)(C2)(C2)

[4]

15. Graph of quadratic function.

Expression	+	–	0	
a		✓		(A1) (C1)
c		✓		(A1) (C1)
$b^2 - 4ac$			✓	(A1) (C1)
b	✓			(A1) (C1)

[4]