Quadratic functions 1

1)

(a) $2x^2 - 8x + 5 = 2(x^2 - 4x + 4) + 5 - 8$ *(M1)*

$= 2(x-2)^2 - 3$ *(A1)(A1)(A1)*

$\Rightarrow \quad a = 2, \quad p = 2, \quad q = -3$ *(C4)*

(b) Minimum value of $2(x-2)^2 = 0$ (or minimum value occurs when $x = 2$) *(M1)*

$\Rightarrow$ Minimum value of $f(x) = -3$ *(A1)* *(C2)*

OR

Minimum value occurs at $(2, -3)$ *(M1)(A1)* *(C2)*

[6 marks]

2)

(a) Since the vertex is at $(3, 1)$

$h = 3$ *(A1)*

$k = 1$ *(A1)*

[2 marks]

(b) $(5, 9)$ is on the graph $\Rightarrow 9 = a(5-3)^2 + 1$ *(M1)*

$= 4a + 1$ *(A1)*

$\Rightarrow 9 - 1 = 4a = 8$ *(A1)*

$\Rightarrow a = 2$ *(AG)*

Note:	Award *(M1)(A1)(A0)* for using a reverse proof, *i.e.* substituting for *a*, *h*, *k* and showing that (5, 9) is on the graph.

[3 marks]

(c) $y = 2(x-3)^2 + 1$ *(M1)*

$= 2x^2 - 12x + 19$ *(AG)*

[1 mark]

3)

QUESTION 3

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.

Quadratic functions 1

4)

Discriminant $\Delta = b^2 - 4ac \left(= (-2k)^2 - 4\right)$ *(A1)*

$\Delta > 0$ *(M2)*

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

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

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 $-1 < k < 1$.

5)

(a) $b = -5, c = 6$ *(A1)(A1)* *(C2)*

(b) (i) $h = 2$ *(A1)* *(C1)*

(ii) $g(x) = a(x-2)^2 + 3$ *(M1)*

$5 = a(0-2)^2 + 3$ *(A1)*

$a = 0.5$ *(A1)* *(C3)*

6)

Discriminant $\Delta = b^2 - 4ac \quad (= k^2 - 36)$ *(A1)*

$\Delta > 0$ *(M2)*

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

$k^2 > 36$ *(A1)*

$k > 6, k < -6$ *(A1)(A1)* *(C6)*

Note: Award ***(A1)*** for $-6 < k < 6$.

7)

(a) $h = 3$ *(A1)*

$k = 2$ *(A1)*

[2 marks]

(b) $f(x) = -(x-3)^2 + 2$

$= -x^2 + 6x - 9 + 2$ (must be a correct expression) *(A1)*

$= -x^2 + 6x - 7$ *(AG)*

[1 mark]

Quadratic functions 1

8)	(a)	$p=-1$ and $q=3$ (or $p=3, q=-1$) (accept $(x+1)(x-3)$)	*(A1)(A1)*	*(C2)*
	(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 (accept $(0,-3)$)	*(A1)*	*(C1)*
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***