Topic 21 Quadratics 2 (Pre-TT) [45] MARKSCHEME

1.

Substituting in formula:

$\frac{-4\pm\sqrt{(4)^2-4\times1\times-10}}{2}$ M1

Allow one error

Errors are: wrong sign for b (+4)

b^2 wrong (=8 or –16)

– 4ac = – 40

M0 for any of the following:

Not dividing whole of top line by 2a

Forgetting square root

Mis-copying formula

– 5.74 A1

Note: some working must be seen answers without working scores M0A0A0

1.7 and – 5.7 or 1.741 and – 5.741

M1 A1 A0

1.74 A1

Alternative method

(completing the square):

$(x + 2)^2 – 14 = 0$ M1

$x = – 2 \pm \sqrt{14}$ A1

$x = – 5.74, 1.74$ (both) A1

[3]

2.

(i) a = 4 B1

10 = 16+b M1

b = – 6 A1

(ii) – 6 B1

[4]

3.

$y^2 = (3x – 1)^2$ M1

$9x^2 – 3x – 3x + 1$ A1

$x^2 + 9x^2 – 6x + 1 = 16$ M1

$10x^2 – 6x – 15 = 0$ A1

$x = 6 \pm \sqrt{(636)} \div 20$ M1

Allow one error in formula

x = – 0.96 and 1.56 A1

y = – 3.88 and 3.68 Must have y values for last A1 A1

[7]

4.

(a) (0, 0) or the origin [B1]

(b) $\sqrt{5}$ [B1]

(c) Attempt to find gradient of radius $= \frac{2-0}{1-0} = 2$ [M1]

Perpendicular gradient is $-\frac{1}{2}$ [M1] negative reciprocal of *their* gradient

Attempt to find equation of line e.g. $y - 2 = -\frac{1}{2}(x - 1)$ [M1] oe

$y = -\frac{1}{2}x + \frac{5}{2}$ [A1] oe

5.

$2 - 5x = 3x^2$ M1

or $y = 3\left(\frac{2-y}{5}\right)^2$

$3x^2 + 5x - 2 = 0$ M1

$3y^2 - 37y + 12 = 0$

$(3x - 1)(x + 2)$ M1

(3y – 1)(y – 12)

$x = \frac{1}{3}$ or -2 A1

$y = \frac{1}{3}$ *or* 12

$y = \frac{1}{3}$ or 12 A1

$x = \frac{1}{3}$ *or* -2

[5]

6.

(a) $12.5 - x$ M1

oe

(b) $x(12.5 - x) = 38$ M1

Sorting to $2x^2 - 25x + 76 = 0$ A1

Need valid intermediate step

(c) $\{25 \pm \sqrt{(25^2 - 4 \times 2 \times 76)}\} \div 4$ M1 A1

M1 allow one error

A1 for correct substitution

7.28 or 5.22 or both A1

[6]

7.

(a) $(2x \pm a)(x \pm b)$ where $ab = 15$ M1

$(2x + 3)(x - 5)$ A1

Ignore further working

(b) -1.5 and (+) 5 B1 ft

Must be seen in (b)

[(their – 1.5)] + (their 5)] ÷ 2 M1

1.75 seen B1*M1*

$x = 1.75$ A1

Note: Must have "x = ..." here

[5]

8.

Alternative method 1		
$P\,(1, 3)$ or $y = 3$ or grad $OP = 3$	B1	
grad $PQ = -\frac{1}{\text{their } 3}$ or $-\frac{1}{3}$	M1	
$y = (\text{their } -\frac{1}{3})\,x + c$ and substitutes (1, their 3) or $y - \text{their } 3 = (\text{their } -\frac{1}{3})(x - 1)$	M1dep	oe $\frac{\text{their } 3}{x-1}$ or $-\frac{\text{their } 3}{x-1}$
Substitutes $y = 0$ in their equation	M1dep	$-\frac{\text{their } 3}{x-1} = \text{their } -\frac{1}{3}$
(10, 0)	A1	

Alternative method 2		
$P\,(1, 3)$ or $y = 3$ or grad $OP = 3$	B1	
$\frac{\text{their } 3}{1} = \frac{QN}{\text{their } 3}$	M1dep	
their 3 × their 3 or 9	M1dep	
tan $PON = \frac{\text{their } 3}{1}$	M1	N is on the x-axis PN is perpendicular to the x-axis
(10, 0)	A1	

9.

$2(x + 4)^2 + 3$	P1	process to find a, eg $2x^2 + 16x + 35 = 2(x^2 + \ldots)$ or $a = 2$
	P1	for $2((x + 4)^2 + \ldots))$ or $b = 4$
	A1	for $2(x + 4)^2 + 3$ or $a = 2$, $b = 4$, $c = 3$
$(-4, 3)$	B1	ft from answer of form $a(x + b)^2 + c$