Question Number	Scheme	Marks
8.	(a) f(0) = 6 $\Rightarrow 0\times a+0\times b+0\times c+d=6$ $\Rightarrow d = 6$ *	B1 (1)
	(b) $a + b + c + d = -6$ and $-a + b - c + d = 12$ $2b + 2d = 6$ $2b = 6 - 12$ $b = -3$	M1 A1 M1 A1 (4)
	(c) $a - 3 + c + 6 = -6$ $\Rightarrow a + c = -9$ (1) $27a + 9b + 3c + d = 0$ $27a - 27 + 3c + 6 = 0$ $27a + 3c = 21$ $\Rightarrow 9a + c = 7$ (2) (2) – (1) $8a = 16$ $a = 2$, $c = -9 - 2 = -11$	M1 M1 A1 M1 A1 A1 (6)
	(d) $f(x) = (x - 3)(2x^2 + 3x - 2)$ $= (x - 3)(2x - 1)(x + 2)$	M1 M1 A1 (3) **[14]**

Question Number	Scheme	Marks
9.	(a) $\frac{dy}{dx} = \frac{1}{2}x$	M1
	at $P(4,4)$ $\frac{dy}{dx} = 2$	A1
	(i) tangent is $y-4=2(x-4)$	M1 A1
	$y=2x-4$	
	(ii) normal is $y-4=-\frac{1}{2}(x-4)$	M1 A1
	$y=-\frac{1}{2}x+6$	
		(6)
	(b) Normal at Q has gradient 2, so tangent has gradient $-\frac{1}{2}$	
	$\frac{1}{2}x=-\frac{1}{2}$	M1
	$x=-1, y=\frac{1}{4}$, $Q(-1,\frac{1}{4})$	A1
		(2)
	(c) Normal at Q	
	$y-\frac{1}{4}=2(x+1)$	M1 A1
	$y=2x+2\frac{1}{4}$	
	At R, $2x+2\frac{1}{4}=-\frac{1}{2}x+6$	M1
	$x=1\frac{1}{2}$	A1
		(4)
	(d) Tangent at Q	
	$y-\frac{1}{4}=-\frac{1}{2}(x+1)$ *or* mid-point QP is $\left(\frac{-1+4}{2}, \frac{\frac{1}{4}+4}{2}\right)=\left(\frac{3}{2}, \frac{17}{8}\right)$	M1 A1
	$y=-\frac{1}{2}x-\frac{1}{4}$	
	at S, $2x-4=-\frac{1}{2}x-\frac{1}{4}$ *or* RS is diagonal of rectangle $PQRS$	M1
	$x=1\frac{1}{2}$ *or* so it passes through $\left(\frac{3}{2}, \frac{17}{8}\right)$ and $R\left(\frac{3}{2}, y\right)$	A1
	RS is parallel to y-axis with reason to justify this. *	B1 cso
	e.g. RS has equation $x=1\frac{1}{2}$	
	or RS passes through two points with x-coordinate $1\frac{1}{2}$	
		(5)
		[17]

Question Number	Scheme	Marks

10.

(a) M (1, 3) — B1

Gradient $AC = \frac{2}{-8}$

$\Rightarrow$ gradient $l = -\left(\frac{-8}{2}\right) = 4$

$y - 3 = 4(x - 1) \Rightarrow y = 4x - 1$ — M1 M1 A1 (4)

Alternative

$AP^2 = (x+3)^2 + (y-4)^2$ and

$CP^2 = (x-5)^2 + (y-2)^2$

where $P(x, y)$ lies on l.

$x^2 + 6x + 9 + y^2 - 8y + 16 = x^2 - 10x + 25 + y^2 - 4y + 4$ — M1

$y = 4x - 1$ — M1 A1 (4)

(b) $AC^2 = 8^2 + 2^2 = 68 \Rightarrow AC = \sqrt{68} = 2\sqrt{17}$ — M1 A1 (2)

(c) $\frac{1}{2}\sqrt{68} \times BM = 17\sqrt{2}$ — M1

$BM = \dfrac{34\sqrt{2}}{2\sqrt{17}} = \sqrt{34}$ — A1 (2)

(d) $AB^2 = AM^2 + BM^2 = \left(\sqrt{17}\right)^2 + \left(\sqrt{34}\right)^2 = 51$ — M1

$AB = \sqrt{51}$ — A1 (2)

(e) $B(x, y)$, $(y-4)^2 + (x+3)^2 = 51$ *or* $(x-1)^2 + (y-3)^2 = 34$ — M1

$y = 4x - 1$ so $(4x-5)^2 + (x+3)^2 = 51$ *or* $(x-1)^2 + (4x-4)^2 = 34$ — M1

$16x^2 - 40x + 25 + x^2 + 6x + 9 = 51$ *or* $(x-1)^2 + 16(x-1)^2 = 34$

$17x^2 - 34x - 17 = 0$ *or* $17(x-1)^2 = 34$ — A1

$x^2 - 2x - 1 = 0$

$x = \dfrac{2 \pm \sqrt{4+4}}{2} = 1 \pm \sqrt{2}$ *or* $x - 1 = \pm\sqrt{2} \Rightarrow x = 1 \pm \sqrt{2}$ — M1 A1

$(1+\sqrt{2},\ 3+4\sqrt{2})$ and $(1-\sqrt{2},\ 3-4\sqrt{2})$ oe — A1 (6)

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