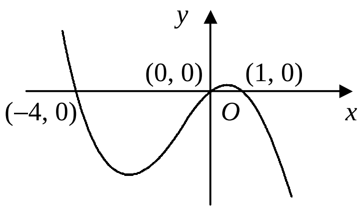
C1 Paper G – Marking Guide

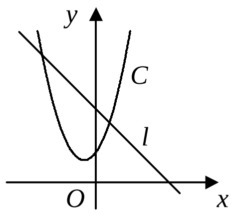
1.		$(2^2)^{y+1} = (2^3)^{2y-1}$	M1	
		$2^{2y+2} = 2^{6y-3}$	A1	
		$2y + 2 = 6y - 3$	M1	
		$y = \frac{5}{4}$	A1	**(4)**
2.		$= \sqrt{\frac{45}{2}} = \frac{3\sqrt{5}}{\sqrt{2}}$	M1 A1	
		$= \frac{3\sqrt{5}}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} = \frac{3}{2}\sqrt{10}$	M1 A1	**(4)**
3.	*(i)*	$(x + 4)^2 - 16 + (y - 2)^2 - 4 + k = 0$	M1	
		$\therefore$ centre $(-4, 2)$	A1	
	(ii)	for x-axis to be tangent, radius must be 2	B1	
		$(x + 4)^2 + (y - 2)^2 = 20 - k$		
		$\therefore\ 20 - k = 2^2$	M1	
		$k = 16$	A1	**(5)**
4.	*(i)*	$= x(4 - 3x - x^2) = x(1 - x)(4 + x)$	M2 A1	
	(ii)		B3	
				(6)
5.	*(i)*	$x^2 - 4x + 2 = 0$		
		$x = \frac{4 \pm \sqrt{16-8}}{2}$	M1	
		$x = \frac{4 \pm 2\sqrt{2}}{2}$	M1	
		$x = 2 \pm \sqrt{2}$ $\quad\therefore\ (2 - \sqrt{2}, 0), (2 + \sqrt{2}, 0)$	A2	
	(ii)	$x^2 - 4x + 2 = 2x + k$		
		$x^2 - 6x + 2 - k = 0$	M1	
		tangent $\therefore$ equal roots, $b^2 - 4ac = 0$		
		$(-6)^2 - [4 \times 1 \times (2 - k)] = 0$	M1 A1	
		$36 - 4(2 - k) = 0$		
		$k = -7$	A1	**(8)**
6.	*(i)*	$t = 0, A = 4 \quad\Rightarrow\quad 4 = p^2$	M1	
		$p > 0\ \therefore\ p = 2$	A1	
		$t = 5, A = 9 \quad\Rightarrow\quad 9 = (2 + 5q)^2$	M1	
		$2 + 5q = \pm 3$		
		$q = \frac{1}{5}(-2 \pm 3)$	M1	
		$q > 0\ \therefore\ q = \frac{1}{5}$	A1	
	(ii)	$A = (2 + \frac{1}{5}t)^2 = 4 + \frac{4}{5}t + \frac{1}{25}t^2$	M1	
		$\frac{dA}{dt} = \frac{4}{5} + \frac{2}{25}t$	M1 A1	
	(iii)	$t = 15\ \therefore\ \frac{dA}{dt} = \frac{4}{5} + \frac{2}{25}(15) = 2\text{ cm}^2\text{ s}^{-1}$	M1 A1	**(10)**

7. *(i)* $x^2 + 2x + 4 = (x + 1)^2 - 1 + 4$ — M1

$= (x + 1)^2 + 3$ — A1

minimum: $(-1, 3)$ — B2

(ii)



B2

B1

(iii) $x^2 + 2x + 4 = 8 - x$

$x^2 + 3x - 4 = 0$

$(x + 4)(x - 1) = 0$ — M1

$x = -4, 1$ — A1

$\therefore$ $(-4, 12)$ and $(1, 7)$ — M1 A1 **(11)**

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8. *(i)* $\text{f}(x) = \dfrac{x^2 - 8x + 16}{2x^{\frac{1}{2}}}$ — M1

$\text{f}(x) = \frac{1}{2}x^{\frac{3}{2}} - 4x^{\frac{1}{2}} + 8x^{-\frac{1}{2}}$, $\quad A = \frac{1}{2}, B = -4, C = 8$ — A2

(ii) $\text{f}'(x) = \frac{3}{4}x^{\frac{1}{2}} - 2x^{-\frac{1}{2}} - 4x^{-\frac{3}{2}}$ — M1 A2

$\text{f}'(x) = \frac{1}{4}x^{-\frac{3}{2}}(3x^2 - 8x - 16) = \dfrac{3x^2 - 8x - 16}{4x^{\frac{3}{2}}}$ — M1 A1

(iii) $\text{f}'(x) = 0 \Rightarrow 3x^2 - 8x - 16 = 0$ — M1

$(3x + 4)(x - 4) = 0$ — M1

$x > 0 \;\therefore x = 4$

$\therefore$ $(4, 0)$ — A1 **(11)**

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9. *(i)* grad $= \dfrac{4-3}{3-(-1)} = \frac{1}{4}$ — M1 A1

$\therefore$ $y - 3 = \frac{1}{4}(x + 1)$ — M1

$4y - 12 = x + 1$

$x - 4y + 13 = 0$ — A1

(ii) perp grad $= \dfrac{-1}{\frac{1}{4}} = -4$ — M1

line through A, perp l_1: $y - 3 = -4(x + 1)$ — M1

$y = -4x - 1$ — A1

intersection with l_2: $x - 4(-4x - 1) - 21 = 0$

$x = 1$, $\therefore$ $(1, -5)$ — M1 A1

dist. A to $(1, -5) = \sqrt{(1+1)^2 + (-5-3)^2} = \sqrt{4+64} = \sqrt{68}$ — M1

$\therefore$ dist. between lines $= \sqrt{68} = \sqrt{4 \times 17} = 2\sqrt{17}$ $\quad [\, k = 2 \,]$ — A1

(iii) $AB = \sqrt{(3+1)^2 + (4-3)^2} = \sqrt{16+1} = \sqrt{17}$ — M1

area $= \sqrt{17} \times 2\sqrt{17} = 34$ — A1 **(13)**

Total **(72)**