### Cambridge International AS/A Level – Mark Scheme PUBLISHED

Question	Answer		Guidance
1	$(4x^{\frac{1}{2}}-3)(x^{\frac{1}{2}}-2)$ oe soi Alt: $4x+6=11\sqrt{x} \Rightarrow 16x^2-73x+36$		Attempt solution for $x^{\frac{1}{2}}$ or sub $u = x^{\frac{1}{2}}$
	$x^{\frac{1}{2}} = \frac{3}{4} \text{ or } 2$ (16x-9)(x-4)	A1	Reasonable solutions for $x^{\frac{1}{2}}$ implies M1 ( $x = 2, 3/4,$ M1A0)
	x = 9/16 oe or 4	A1	Little or no working shown scores SCB3, spotting one solution, B0
		3	

Question	Answer	Marks	Guidance
2	2 $x^{2} + bx + 5 = x + 1 \rightarrow x^{2} + x(b - 1) + 4 (= 0)$		Eliminate <i>x</i> or <i>y</i> with all terms on side of an equation
	$(b^2 - 4ac =) (b-1)^2 - 16$	M1	
	<i>b</i> associated with $-3 \& +5$ or $b-1$ associated with $\pm 4$	A1	$(x-2)^2 = 0 \operatorname{or} (x+2)^2 = 0, x = \pm 2, b-1 = \pm 4$ (M1A1) Association can be an equality or an inequality
	$b \ge 5, b \le -3$	A1	
		4	

## Cambridge International AS/A Level – Mark Scheme **PUBLISHED**

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9709\_w18\_ms\_11

Question	Answer	Marks	Guidance
3(i)	Gradient of $AB = -3/4$	B1	Accept $-3a/4a$
	$y = -\frac{3}{4}x \text{ oe}$	B1FT	Answer must not include <i>a</i> . Ft on <i>their</i> <u>numerical</u> gradient
		2	
3(ii)	$(4a)^2 + (3a)^2 = (10/3)^2$ soi	M1	May be unsimplified
	$25a^2 = 100/9$ oe	A1	
	a = 2/3	A1	
		3	

Question	Answer	Marks	Guidance
4(i)	$S_{80} = \frac{80}{2} \Big[ 12 + 79 \times (-4) \Big] \text{ or } \frac{80}{2} \Big[ 6 + l \Big], l = -310$	M1A1	Correct formula (M1). Correct <i>a</i> , <i>d</i> and <i>n</i> (A1).
	-12 160	A1	
		3	
4(ii)	$S_{\infty} = \frac{6}{1 - \frac{1}{3}} = 9$	M1A1	Correct formula with $ r  < 1$ for M1
		2	

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Question	Answer	Marks	Guidance
5(i)	$\frac{(\cos\theta - 4)(5\cos\theta - 2) - 4\sin^2\theta}{\sin\theta(5\cos\theta - 2)}  (=0)$	M1	Accept numerator only
	$\frac{5\cos^2\theta - 22\cos\theta + 8 - 4(1 - \cos^2\theta)}{\sin\theta(5\cos\theta - 2)}  (=0)$	M1	Simplify numerator and use $s^2 = 1 - c^2$ . Accept numerator only
	$9\cos^2\theta - 22\cos\theta + 4 = 0$ www <b>AG</b>	A1	
		3	
5(ii)	Attempt to solve for $\cos\theta$ , (formula, completing square expected)	M1	Expect $\cos\theta = 0.1978$ . Allow 2.247 in addition
	$\theta = 78.6^{\circ}$ , 281.4° (only, second solution in the range)	A1A1FT	Ft for (360° – 1st solution)
		3	

Question

6(i)

6(ii)

6(iii)

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PUBLISHED	9709_w18_ms_1	
Answer	Marks	Guidance
$0 = 9a + 3a^2$	M1	Sub $\frac{dy}{dx} = 0$ and $x = 3$
a = -3 only	A1	
	2	
$\frac{dy}{dx} = -3x^2 + 9x \to y = -x^3 + \frac{9x^2}{2} (+c)$	M1A1FT	Attempt integration. $\frac{1}{3}ax^3 + \frac{1}{2}a^2x^2$ scores M1. Ft on <i>their a</i> .
$9\frac{1}{2} = -27 + 40\frac{1}{2} + c$	DM1	Sub $x = 3, y = 9\frac{1}{2}$ . Dependent on <i>c</i> present
<i>c</i> = -4	A1	Expect $y = -x^3 + \frac{9x^2}{2} - 4$
	4	
$\frac{\mathrm{d}^2 y}{\mathrm{d}x^2} = -6x + 9$	M1	$2ax + a^2$ scores M1
At $x = 3$ , $\frac{d^2 y}{dx^2} = -9 < 0$ MAX www	A1	Requires at least one of $-9$ or $< 0$ . Other methods possible.

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#### Cambridge International AS/A Level – Mark Scheme **PUBLISHED**

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9709 w18 ms 11

Question	Answer	Marks	Guidance
7(i)	$2 = k(8 - 28 + 24) \to k = 1/2$	B1	
		1	
7(ii)	When $x = 5$ , $y = [\frac{1}{2}](125 - 175 + 60) = 5$	M1	Or solve $[\frac{1}{2}](x^3 - 7x^2 + 12x) = x \Longrightarrow x = 5 [x = 0, 2]$
	Which lies on $y = x$ , oe	A1	
		2	
7(iii)	$\int [\frac{1}{2}(x^3 - 7x^2 + 12x) - x]dx.$	M1	Expect $\int \frac{1}{2}x^3 - \frac{7}{2}x^2 + 5x$
	$\frac{1}{8}x^4 - \frac{7}{6}x^3 + \frac{5}{2}x^2$	B2,1,0FT	Ft on their k
	2-28/3+10	DM1	Apply limits $0 \rightarrow 2$
	8/3	A1	
	OR $\frac{1}{8}x^4 - \frac{7}{6}x^3 + 3x^2$	B2,1,0FT	Integrate to find area under curve, Ft on their $k$
	2-28/3+12	M1	Apply limits $0 \rightarrow 2$ . Dep on integration attempted
	Area $\Delta = \frac{1}{2} \times 2 \times 2$ or $\int_{0}^{2} x dx = \left[\frac{1}{2}x^{2}\right] = 2$	M1	
	8/3	A1	
		5	

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970	9	w1	8	ms	11
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Question	Answer	Marks	Guidance
8(i)	$\overrightarrow{DF} = -6\mathbf{i} + 2\mathbf{k}$	B1	
		1	
8(ii)	$\overrightarrow{EF} = -6\mathbf{i} - 3\mathbf{j} + 2\mathbf{k}$	B1	
	$ \vec{EF}  = \sqrt{(-6)^2 + (-3)^2 + 2^2}$	M1	Must use <i>their</i> $\overrightarrow{EF}$
	Unit vector = $\frac{1}{7}(-6\mathbf{i}-3\mathbf{j}+2\mathbf{k})$	A1	
		3	
8(iii)	$\overrightarrow{DF}.\overrightarrow{EF} = (-6\mathbf{i} + 2\mathbf{k}).(-6\mathbf{i} - 3\mathbf{j} + 2\mathbf{k}) = 36 + 4 = 40$	M1	
	$ \overrightarrow{DF}  = \sqrt{40},  \overrightarrow{EF}  = 7$	M1	
	$\cos EFD = \frac{40}{7\sqrt{40}}  \text{oe}$	M1	
	<i>EFD</i> = 25.4°	A1	Special case: use of cosine rule M1(must evaluate lengths using correct method) A1 only
		4	

9709/11

## Cambridge International AS/A Level – Mark Scheme **PUBLISHED**

PUBLISHED			9709_w18_ms_11
Question	Answer	Marks	Guidance
9	Angle $OAB = \pi / 2 - \pi / 5 = 3\pi / 10$ soi	B1	Allow 54° or 0.9425 rads
	Sector $CAB = \frac{1}{2} \times \left( their \frac{3\pi}{10} \right) \times 5^2$	M1	Expect 11.78
	$OA = \frac{5}{\sin\frac{\pi}{5}} = 8.507$	M1A1	May be implied by $OC = 3.507$
	Sector $COD = \frac{1}{2} \times (their 3.507)^2 \times \frac{\pi}{5}$	M1	Expect 3.86
	$\Delta OAB = \frac{1}{2} \times 5 \times (their  8.507) \sin \frac{3\pi}{10}$	M1	Or $\frac{1}{2} \times 5 \times \frac{5}{\tan \frac{\pi}{5}}$ or $2.5 \times \sqrt{(their 8.507)^2 - 25}$
	= 17.20 or 17.21	A1	
	Shaded area $17.20(or 17.21) - 11.78 - 3.86 = 1.56$ or $1.57$	A1	
		8	

## Cambridge International AS/A Level – Mark Scheme **PUBLISHED**

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Question	Answer	Marks	Guidance
10(i)(a)	$\frac{\mathrm{d}y}{\mathrm{d}x} = \left[-\frac{1}{2}\left(4x - 3\right)^{-2}\right] \times \left[4\right]$	B1B1	Can gain this in part <b>(b)(ii)</b>
	When $x = 1$ , $m = -2$	B1FT	Ft from <i>their</i> $\frac{dy}{dx}$
	Normal is $y - \frac{1}{2} = \frac{1}{2}(x-1)$	M1	Line with gradient $-1/m$ and through A
	$y = \frac{1}{2}x$ soi	A1	Can score in part (b)
		5	
10(i)(b)	$\frac{1}{2(4x-3)} = \frac{x}{2} \rightarrow 2x(4x-3) = 2 \rightarrow (2)(4x^2 - 3x - 1) (= 0)$	M1A1	x/2 seen on RHS of equation can score <i>previous</i> A1
	x = -1/4	A1	Ignore $x = 1$ seen in addition
		3	
10(ii)	Use of chain rule: $\frac{dy}{dt} = (their - 2) \times (\pm) 0.3 = 0.6$	M1A1	Allow +0.3 or -0.3 for M1
		2	

## Cambridge International AS/A Level – Mark Scheme **PUBLISHED**

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9709\_w18\_ms\_11

Question	Answer	Marks	Guidance
11(a)(i)	[Greatest value of <i>a</i> is] 3	B1	Must be in terms of <i>a</i> . Allow $a < 3$ . Allow $a \leq 3$
		1	
11(a)(ii)	Range is $y > -1$	B1	Ft on <i>their a</i> . Accept any equivalent notation
	$y = (x-3)^2 - 1 \rightarrow (x-3)^2 = 1 + y \rightarrow x = 3(\pm)\sqrt{1+y}$	M1	Order of operations correct. Allow sign errors
	$f^{-1}(x) = 3 - \sqrt{1+x}$ cao	A1	
		3	
11(b)(i)	$gg(2x) = [(2x-3)^2 - 3]^2$	B1	
	$(2x-3)^4 - 6(2x-3)^2 + 9$	B1	
		2	
11(b)(ii)	$\left[16x^{4} - 96x^{3} + 216x^{2} - 216x + 81\right] + \left[\left(-24x^{2} + 72x - 54\right) + 9\right]$	B4,3,2,1,0	
	$16x^4 - 96x^3 + 192x^2 - 144x + 36$		
		4	