

Mark Scheme 4722

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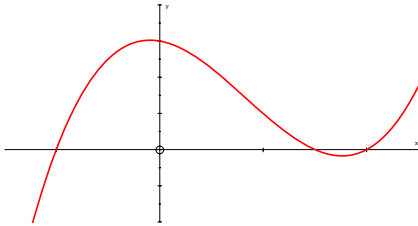
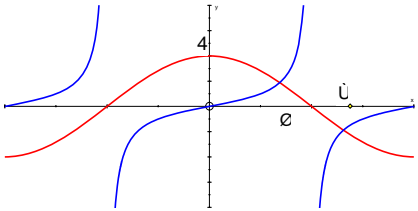
1	(i)	$a + 19d = 10, \quad a + 49d = 70$ Hence $30d = 60 \Rightarrow d = 2$ $a + (19 \times 2) = 10$ or $a + (49 \times 2) = 70$ Hence $a = -28$	M1 A1 M1 A1	4	Attempt to find d from simultaneous equations involving $a + (n-1)d$ or equiv method Obtain $d = 2$ Attempt to find a from $a + (n-1)d$ or equiv Obtain $a = -28$
	(ii)	$S = \frac{29}{2}(2 \times -28 + (29-1) \times 2) = 0$	M1 A1		For relevant use of $\frac{1}{2}n(2a + (n-1)d)$ For showing the given result correctly AG
6					
2	(i)	$\Delta = \frac{1}{2} \times 10 \times 7 \times \sin 80 = 34.5 \text{cm}^2$	M1 A1	2	For use of $\frac{1}{2}ca \sin B$ or complete equiv. For correct value 34.5
	(ii)	$b^2 = 10^2 + 7^2 - 2 \times 10 \times 7 \times \cos 80$ Hence length of CA is 11.2 cm	M1 A1		For attempted use of the correct cosine formula For correct value 11.2
	(iii)	$\sin C = \frac{10 \sin 80}{11.166...} = 0.8819...$ Hence angle C is 61.9°	M1 A1		For use of the sine rule to find C , or equivalent For correct value 61.9
6					
3	(i)	$(1-2x)^{12} = 1 - 24x + 264x^2$	B1 M1 A1	3	Obtain 1 and $-24x \dots$ Attempt x^2 term, including attempt at binomial coeff. Obtain $\dots 264x^2$
	(ii)	$(1 \times 264) + (3 \times -24) = 192$	M1 A1√ A1		Attempt coefficient of x^2 from two pairs of terms Obtain correct unsimplified expression Obtain 192
6					
4	(i)	$\text{perimeter} = (15 \times 1.8) + (20 \times 1.8) + 5 + 5$ $= 73 \text{cm}$	M1 A1 A1	3	Use $r\theta$ at least once Obtain at least one of 27cm or 36cm Obtain 73
	(ii)	$\text{area} = \left(\frac{1}{2} \times 20^2 \times 1.8 \right) - \left(\frac{1}{2} \times 15^2 \times 1.8 \right)$ $= 157.5 \text{cm}^2$	M1 M1 A1		Attempt area of sector using $kr^2\theta$ Find difference between attempts at two sectors Obtain 157.5 / 158
6					

4722

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5	(i)	$r = \frac{4.8}{5} = 0.96 \Rightarrow S_{\infty} = \frac{5}{0.04} = 125$	B1*	2	For correct value of r used		
			B1 dep*		For correct use of $\frac{a}{1-r}$ to show given answer AG		
5	(ii)	$S_n = \frac{5(1-0.96^n)}{1-0.96}$ <p>Hence $1-0.96^n > 0.992 \Rightarrow 0.96^n < 0.008$</p> $n \log 0.96 < \log 0.008$ <p>Hence $n > \frac{\log 0.008}{\log 0.96} \approx 118.3$</p> <p>Least value of n is 119</p>	B1	6 8	For correct, unsimplified, S_n		
			M1		For linking S_n to 124 ($>$ or $=$) and multiplying through by 0.04, or equiv.		
			A1		For showing the given result correctly, with correct inequality throughout AG		
			B1		For correct log statement seen or implied (ignore sign)		
			M1		For dividing both sides by $\log 0.96$		
			A1		For correct (integer) value 119		
6	(a)	$\frac{2}{3}x^{\frac{3}{2}} + 4x + c$	M1	4	For $kx^{\frac{3}{2}}$		
			A1		For correct first term $\frac{2}{3}x^{\frac{3}{2}}$, or equiv		
			B1		For correct second term $4x$		
			B1		For $+c$		
6	(b)(i)	$\int_1^a 4x^{-2} dx = [-4x^{-1}]_1^a$ $= 4 - \frac{4}{a}$	M1	3	Obtain integral of the form kx^{-1}		
			M1		Use limits $x = a$ and $x = 1$		
			A1		Obtain $= 4 - \frac{4}{a}$, or equivalent		
6	(ii)	4	B1√	1	State 4, or legitimate conclusion from their (b)(i)		
7	(i)(a)	$\log_{10}x - \log_{10}y$	B1	3	For the correct answer		
			(b)		$1 + 2\log_{10}x + \log_{10}y$	M1	Sum of three log terms involving 10, x^2 , y
						A1	For correct term $2\log_{10}x$
	(ii)	$2\log_{10}x - 2\log_{10}y = 2 + 2\log_{10}x + \log_{10}y$ <p>Hence $3\log_{10}y = -2$</p> <p>So $y = 10^{-\frac{2}{3}} \approx 0.215$</p>	A1	M1	4	For both correct terms 1 and $\log_{10}y$	
						A1	For relevant use of results from (i)
					For correct use of $a = \log_{10} c \Leftrightarrow c = 10^a$		
					For the correct value 0.215		

8	(i)	$-2 + k + 1 + 6 = 0 \Rightarrow k = -5$ <p>OR</p> <p>OR</p> <p><i>EITHER:</i> $(x+1)(2x^2 - 7x + 6)$</p> $= (x+1)(x-2)(2x-3)$ <p><i>OR:</i> $f(2) = 16 - 20 - 2 + 6 = 0$ Hence $(x-2)$ is a factor Third factor is $(2x-3)$ Hence $f(x) = (x+1)(x-2)(2x-3)$</p>	M1 A1 M1 A1 B2 B1 M1 A1 A1 M1 A1 M1 A1		For attempting $f(-1)$ For equating $f(-1)$ to 0 and deducing the correct value of k AG Match coefficients and attempt k Show $k = -5$ Following division, state remainder is 0, hence $(x+1)$ is a factor, hence $k = -5$ For correct leading term $2x^2$ For attempt at complete division by $f(x)$ by $(x+1)$ or equiv. For completely correct quadratic factor For all three factors correct For further relevant use of the factor theorem For correct identification of factor $(x-2)$ For any method for the remaining factor For all three factors correct
	(ii)	$\int_{-1}^2 f(x) dx = \left[\frac{1}{2}x^4 - \frac{5}{3}x^3 - \frac{1}{2}x^2 + 6x \right]_{-1}^2$ $= \left(8 - \frac{40}{3} - 2 + 12 \right) - \left(\frac{1}{2} + \frac{5}{3} - \frac{1}{2} - 6 \right)$ $= 9$	B1√ B1√ M1 A1		For any two terms integrated correctly For all four terms integrated correctly For evaluation of $F(2) - F(-1)$ For correct value 9
	(iii)		B1 B1	2 1 2	For sketch of positive cubic, with three distinct, non-zero, roots For correct explanation that some of the area is below the axis
9	(i)		B1 B1 B1	3	For correct sketch of one curve For correct shape and location of second curve, on same diagram For intercept 4 on y-axis
	(ii)	(See diagram above) $\beta = 180 - \alpha$	B1 M1 A1	3	For correct identification of intersections – in correct order For attempt to use symmetry of the graphs For the correct (explicit) answer for β
	(iii)	$\sin x = 4 \cos^2 x = 4(1 - \sin^2 x)$ <p>Hence $4 \sin^2 x + \sin x - 4 = 0$</p> $\sin x = \frac{-1 \pm \sqrt{65}}{8}$ <p>Hence $\beta - \alpha = 118.02... - 61.97... \approx 56^\circ$</p>	M1 M1 A1 B1 M1 A1	6 1	For use of $\tan x = \frac{\sin x}{\cos x}$ For use of $\cos^2 x = 1 - \sin^2 x$ For showing the given equation correctly For correct solution of quadratic Attempt value for x from their solutions For the correct value 56

4722

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2
