

Sec 4 Maths

Exam papers with worked solutions

SET C

PAPER 2

Answer

Compiled by

THE MATHS CAFE

Q	Steps / Answers	Type of Marks	Total Marks	Remarks
1	(a) (i) $p = 2p^{\frac{1}{2}} + 15$ $\left(p^{\frac{1}{2}} + 3\right)\left(p^{\frac{1}{2}} - 5\right) = 0$ $\frac{1}{2}\lg p = \lg 5$ 25 3.22	M1 M1 M1 M1 A1	5	for correct substitution for correct factorisation
	(a) (ii) $(2^{3x+2})(3^{x-1}) = 2^4$ $3^{x-1} = 2^{4-3x-2}$ $(x-1)\lg 3 = (2-3x)\lg 2$ 0.782	M1 M1 M1 A1	4	for identifying common base for using law of indices for using $\log_a x^r = r \log_a x$
	(b) (i) $p + q = 3$ $3p + q = 5$ $p = 1, q = 2$	M1 M1 A1	3	
	(b) (ii) $\log_3 y = \log_3 x + 2$ $\log_3 \frac{y}{x} = 2$ $y = 9x$	M1 M1 A1	3	for correct substitution for using $\log_a x - \log_a y = \log_a \frac{x}{y}$
2	(a) $2 \tan x + 4 = \sec^2 x$ $2 \tan x + 4 = 1 + \tan^2 x$ $(\tan x + 1)(\tan x - 3) = 0$ 71.6°, 135°, 251.6°, 315°	M1 M1 M1 A1	4	for using $\sec = \frac{1}{\cos}$ for using $\sec^2 x = 1 + \tan^2 x$ for correct factorisation
	(b) (i) basic shape correct amplitude correct no. of cycles	G1 G1 G1	3	
	(b) (ii) $y = 2 - \frac{x}{2\pi}$ correct table of values 8 solutions	M1 M1 A1	3	for correct line
3	(a) $2x = 6 - 3y$ $(6 - 3y + 1)^2 + 6(y - 2)^2 = 49$ $(5y - 2)(y - 4) = 0$ $\left(2\frac{2}{5}, \frac{2}{5}\right)$ and $(-3, 4)$	M1 M1 M1 M1		for correct new equation for correct substitution for correct factorisation

		6.49	A1	5	
	(b)	$\frac{1}{9-6\sqrt{5}+5} + \frac{1}{9+6\sqrt{5}+5}$ $\frac{1}{14-6\sqrt{5}} \left(\frac{14+6\sqrt{5}}{14+6\sqrt{5}} \right) + \frac{1}{14+6\sqrt{5}} \left(\frac{14-6\sqrt{5}}{14-6\sqrt{5}} \right)$ <p>Denominator = 16 1.75</p>	M1 M1 M1 A1	4	for correct expansion for rationalization for simplification
4	(a)	$Ax - 2A + B$ $A = 1$ $B = 2$ $\int \left[\frac{1}{x-2} + \frac{2}{(x-2)^2} \right] dx$ $\ln(x-2)$ $\frac{2(x-2)^{-2+1}}{(1)(-1)}$ $[\ln 2 - 1] - [\ln 1 - 2]$ 1.69	M1 A1 A1 M1 M1 M1 M1 A1	8	for recognizing application of PF in integration for 1 st integral for 2 nd integral for using limits
5	(a)	$r^2 = 144 - h^2$ $\frac{1}{3}\pi(144 - h^2)h$ $48\pi h - \frac{1}{3}\pi h^3$	M1 M1 A1	3	for using PT for correct substitution
	(b)	$48\pi - \pi h^2$ $48\pi - \pi h^2 = 0$ 6.93 max value	M1 M1 M1 A1	4	for differentiation for using stationary values = 0
	(a) (i)	$8 \left[e^{\frac{x}{2}} \left(\frac{1}{2} \right) \right] + c$ $2e^{\frac{x}{2}} + c$	M1, M1 A1	3	for correct integration for constant, c.
6	(a) (ii)	$6 \left[\frac{1}{2} \sin 2x \right]$ $3 \left[\sin 2\pi - \sin \frac{\pi}{2} \right]$ -3	M1 M1 A1	3	for correct integration for using limits
	(b) (i)	$e^{2x} (1) + x(2e^{2x})$ $e^{2x} (1 + 2x)$	M1 A1	2	for using product rule allow B2 if $e^{2x} (1) + x(2e^{2x})$ seen

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	(b)(i) i)	$e^{2x}(1+2x) = 0$ 0.5	M1 A1	2	for using $\frac{dy}{dx} = 0$.
	(b) (iii)	$\int e^{2x}(1+2x)dx = xe^{2x}$ $\int e^{2x}dx + \int 2xe^{2x}dx$ $\int 2xe^{2x}dx = xe^{2x} - \frac{1}{2}e^{2x} + c$ $\int 4xe^{2x}dx = 2xe^{2x} - e^{2x} + c$	M1 M1 M1 A1	4	for showing integration is reverse of differentiation for splitting up integrals for indication of $2xe^{2x}$ be subject
	(a)	$2x^2 + (4-k)x + (2-3k) = 0$ $(4-k)2 - 4(2)(2-3k) > 0$ $k(k+16) > 0$ $k < -16$ and $k > 0$	M1 M1 M1 A1	4	
	(b)	$\alpha + \beta = -2$ and $\alpha\beta = -0.5$ product of roots = -9 sum of roots = 2 $x^2 - 2x - 9 = 0$	M1 M1 M1 A1	4	
8	(a)	$AB = \cos \theta, AD = 6 + 2 \sin \theta$ $P = 4 \sin \theta + 8 \cos \theta = 12$	M1 A1	2	
	(b)	$\alpha = 1.1071$ $P = 12 + 4\sqrt{5} \sin(\theta + 1.1071)$	M1 A1	2	
	(c)	20.9 cm	A1	1	
	(d)	$\sin(\theta + 1.1071) = \frac{3}{2\sqrt{5}}$ $\theta = 1.30$	M1 A1	2	
	(e)	$ABCD = 4 \cos \theta (6 + 2 \sin \theta)$ $XAB = 4 \cos \theta \sin \theta$ $4 \cos \theta (6 + 2 \sin \theta) = 5(4 \cos \theta \sin \theta) + 6$ $4 \cos \theta = \sin 2\theta + 1$	M1 M1 A1	3	
9	(a)	$y - (-4) = \frac{3}{4}(x - 0)$ $4y + 16 = 3x$ $y - 6 = -\frac{4}{3}(x - 5)$ $4x + 3y = 38$	A1 M1 A1	3	allow B1 for $y = \frac{3}{4}x - 4$
	(b)	solving sim eqns (8,2) $\frac{x+0}{2} = 8, \frac{y+(-4)}{2} = 2$	M1 M1 M1		

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		(16, 8)	A1	4	
	(c)	$\begin{array}{c ccc } \hline 1 & 5 & 0 & 16 & 5 \\ \hline 2 & 6 & -4 & 8 & 6 \\ \hline \end{array}$ 50	M1 A1	 2	for correct substitution of formula
10	(a)	$\lg y = -2x \lg h + \lg k$ $\text{grad} = -2 \lg h$ $y\text{-intercept} = \lg k$	A1 A1	 2	
	(b)	new table of values $k = 13.2$ $h = 1.13$ appropriate scale straight line that intersects vertical axis	M1 M1 M1 M1 M1	 5	
	(c) (i)	$x = 24$	A1	 1	
	(c) (ii)	$\lg y = 0.73$ $y = 5.37$	M1 A1	 2	