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Pure Mathematics P2(6672)

Summer 2005

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Mark Scheme (Results)

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June 2005
6672 Pure P2
Mark Scheme (Final)

Question Number	Scheme	Marks
1	(a) $\log 5^x = \log 8$ or $x = \log_5 8$	M1
	Complete method for finding *x*: $x = \frac{\log 8}{\log 5}$ or $\frac{\ln 8}{\ln 5}$	M1
	$= 1.29$ only	A1 (3)
	(b) Combining two logs: $\log_2 \frac{(x+1)}{x}$ or $\log_2 7x$	M1
	Forming equation in *x* (eliminating logs) legitimately	M1
	$x = \frac{1}{6}$ or $0.1\dot{6}$	A1 (3)
		[6]
2	(a) $1 + 12px$, $+ 66p^2x^2$ (accept any correct equivalent)	B1,B1 (2)
	(b) $12p = -q$, $66p^2 = 11q$ Forming 2 equations by comparing coefficients	M1
	Solving for *p* or *q*	M1
	$p = -2$, $q = 24$	A1A1 (4)
		[6]

3 (a)

x	0	4	8	12	16	20
y	0	**1.6(00)**	2.771	**3.394**	**3.2(00)**	0

1.6(00), 3.2(00) B1

3.394 B1 (2)

(b) A ≈ ½ x 4, x [(0 + 0) + 2{1.60 + 2.771 + 3.394 + 3.20}]

follow through on candidate's *y* values B1, [M1A1√]

≈ 43.8(6), 43.9 or 44 m^2 A1 (4)

(c) Vol/min ≈ [answer to (b) x 2] x 60 = 5260, 5270 or 5280 (m^3 per min) M1 A1 (2)

[8]

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4 (a) $f(x) = \dfrac{5x+1}{(x+2)(x-1)} - \dfrac{3}{x+2}$ factors of quadratic denominator B1

$= \dfrac{5x+1-3(x-1)}{(x+2)(x-1)}$ common denominator M1

simplify to linear numerator M1

$= \dfrac{2x+4}{(x+2)(x-1)} = \dfrac{2(x+2)}{(x+2)(x-1)} = \dfrac{2}{x-1}$ AG A1 (4) (cso)

(b) $y = \dfrac{2}{x-1} \Rightarrow xy - y = 2 \Rightarrow$ M1

$xy = 2 + y$ or $x - 1 = \dfrac{2}{y}$ A1

$f^{-1}(x) = \dfrac{2+x}{x}$ or equiv. A1 (3)

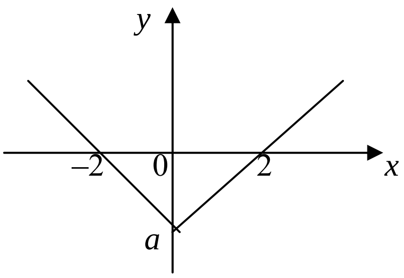
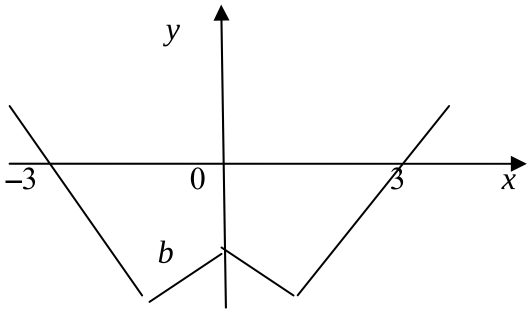
(c) $fg(x) = \dfrac{2}{x^2+4}$ (attempt) $[\dfrac{2}{"g"-1}]$ M1

Setting $\dfrac{2}{x^2+4} = \dfrac{1}{4}$ and finding $x^2 = \ldots$; $x = \pm 2$ DM1; A1 (3)

[10]

Question Number	Scheme	Marks
5	(a) $\left(\frac{x+1}{x}\right)^2 = 1+\frac{2}{x}+\frac{1}{x^2}$ anywhere	B1
	$V = \pi\int\left(\frac{x+1}{x}\right)^2 \mathrm{d}x$	M1
	$\int\left(\frac{x+1}{x}\right)^2 \mathrm{d}x = x-\frac{1}{x}$, $+ 2\ln x$ [M1 attempt to $\int$]	M1A1,A1
	Using limits correctly in their integral: $(\pi)\{[x+2\ln x-\frac{1}{x}]^3 - [x+2\ln x-\frac{1}{x}]_1\}$	M1
	V = π [2⅔ + 2ln3] (must be exact)	A1 (7)
	(b) Volume of cone (or vol. generated by line) = $\frac{1}{3}\pi$ x 2^2 x 2	B1
	$V_R = V_S -$ volume of cone $= V_S -$ ⅓π x 2^2 x 2	M1
	$= 2\pi\ln3$ or $\pi\ln9$	A1 (3)
		[10]

6	(a) $f'(x) = 3\,e^{x} - \frac{1}{2x}$	M1A1A1 (3)
	[M1: any evidence to suggest that tried to differentiate]	
	(b) $3e^{\alpha} - \frac{1}{2\alpha} = 0$ [Equating $f'(x)$ to zero]	M1
	$\Rightarrow \quad 6\alpha\, e^{\alpha} = 1 \quad \Rightarrow \alpha = \frac{1}{6}\,e^{-\alpha}$ AG	A1 (cso) (2)
	(c) $x_1 = 0.0613...,\ x_2 = 0.1568..,\ x_3 = 0.1425...,\ x_4 = 0.1445....$	M1A1 (2)
	[M1 at least x_1 correct, A1 all correct to 4 d.p.]	
	(d) Using $f'(x)$ $\{= 3\,e^{x} - \frac{1}{2x}\}$ with suitable interval	M1
	[e.g. f(0.14425) = – 0.0007, f(0.14435) = + 0.002(1)]	
	Both correct with concluding statement.	A1 (2)
		[9]

7	(a) 	
	Translation ← by 1	M1
	Intercepts correct	A1 (2)
	(b) 	
	$x \geq 0$, correct "shape"	B1
	[provided not just original]	
	Reflection in y-axis	B1√
	Intercepts correct	B1 (3)
	(c) $a = -2, \quad b = -1$	B1B1(2)
	(d) Intersection of $y = 5x$ with $y = -x - 1$	M1A1
	Solving to give $x = -\frac{1}{6}$	M1A1 (4)
		[11]

8	(a) $2\sin(\theta + 30)^{\circ} = \cos(\theta + 60)^{\circ}$	
	$2\sin\theta^{\circ}\cos 30^{\circ} + 2\cos\theta^{\circ}\sin 30^{\circ} = \cos\theta^{\circ}\cos 60^{\circ} - \sin\theta^{\circ}\sin 60^{\circ}$	B1B1
	$\frac{2\sqrt{3}}{2}\sin\theta^{\circ} + \frac{2}{2}\cos\theta^{\circ} = \frac{1}{2}\cos\theta^{\circ} - \frac{\sqrt{3}}{2}\sin\theta^{\circ}$	M1
	Finding $\tan\theta^{\circ}$, $\tan\theta^{\circ} = -\frac{1}{3\sqrt{3}}$ or equiv. exact	M1,A1 (5)
	(b) (i) Setting $A = B$ to give $\cos 2A = \cos^2 A - \sin^2 A$	M1
	Correct completion: $= (1 - \sin^2 A) - \sin^2 A = 1 - 2\sin^2 A$	A1 (2)
	[Need to see intermediate step above for A1]	
	(ii) Forming quadratic in sin$x$ $[2\sin^2 x + \sin x - 1 = 0]$	M1
	Solving $[(2\sin x - 1)(\sin x + 1) = 0$ or formula] $[\sin\theta = ½$ or $\sin\theta = -1]$	M1
	$\theta = \frac{\pi}{6}, \frac{5\pi}{6}$; [A1√ for $\pi - "\alpha"$]	A1,A1√
	$\theta = \frac{3\pi}{2}$	A1 (5)
	(iii) LHS $= 2\sin y\cos y\frac{\sin y}{\cos y} + (1 - 2\sin^2 y)$	
	[B1 use of tan$y = \frac{\sin y}{\cos y}$, M1 forming expression in sin$y$,cos$y$ only]	B1M1
	Completion: $= 2\sin^2 y + (1 - 2\sin^2 y) = 1$ AG	
	[*Alternative*: LHS $= \frac{\sin 2y\sin y + \cos 2y\cos y}{\cos y}$ B1M1	A1 (3) **[15]**
	$= \frac{\cos(2y - y)}{\cos y} = 1$ A1]	