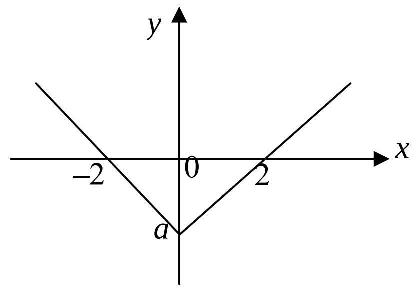
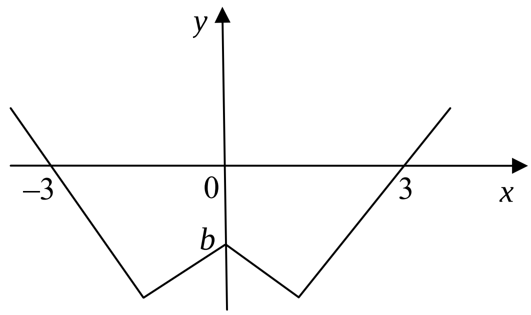
June 2005
6672 Pure P2
Mark Scheme (Final)

Question Number	Scheme	Marks
1 (*a*)	$\log 5^x = \log 8$ or $x = \log_5 8$	M1
	Complete method for finding *x*: $x = \dfrac{\log 8}{\log 5}$ or $\dfrac{\ln 8}{\ln 5}$	M1
	$= 1.29$ only	A1 (3)
(*b*)	Combining two logs: $\log_2 \dfrac{(x+1)}{x}$ or $\log_2 7x$	M1
	Forming equation in *x* (eliminating logs) legitimately	M1
	$x = \dfrac{1}{6}$ 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)	**1.6(00), 3.2(00)**	B1
	<table><tr><td>*x*</td><td>0</td><td>4</td><td>8</td><td>12</td><td>16</td><td>20</td></tr><tr><td>*y*</td><td>0</td><td>**1.6(00)**</td><td>2.771</td><td>**3.394**</td><td>**3.2(00)**</td><td>0</td></tr></table>	
	3.394	B1 (2)
(b)	A ≈ ½ × 4, × [(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) × 2] × 60 = 5260, 5270 or 5280 (m^3 per min)	M1 A1 (2)
		[8]

Question Number	Scheme	Marks
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 (cso) (4)
(*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]
5. (a)	$\left(\dfrac{x+1}{x}\right)^2 = 1 + \dfrac{2}{x} + \dfrac{1}{x^2}$ anywhere	B1
	$V = \pi \int \left(\dfrac{x+1}{x}\right)^2 dx$	M1
	$\int \left(\dfrac{x+1}{x}\right)^2 dx = x - \dfrac{1}{x}$, $+ 2\ln x$ [M1 attempt to $\int$]	M1 A1, A1
	Using limits correctly in their integral:	M1
	$(\pi)\{[x + 2\ln x - \dfrac{1}{x}]^3 - [x + 2\ln x - \dfrac{1}{x}]_1\}$	
	$V = \pi\ [2\tfrac{2}{3} + 2\ln 3]$ (must be exact)	A1 (7)
(b)	Volume of cone (or vol. generated by line) $= \dfrac{1}{3}\pi \times 2^2 \times 2$	B1
	$V_R = V_S -$ volume of cone $= V_S - \tfrac{1}{3}\pi \times 2^2 \times 2$	M1
	$= 2\pi \ln 3$ or $\pi \ln 9$	A1 (3)
		[10]

Question Number	Scheme	Marks
6. (a)	$f'(x) = 3e^x - \frac{1}{2x}$ [M1: any evidence to suggest that tried to differentiate]	M1A1A1 (3)
(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)	$x_1 = 0.0613\ldots$, $x_2 = 0.1568..$, $x_3 = 0.1425\ldots$, $x_4 = 0.1445\ldots$ [M1 at least x_1 correct , A1 all correct to 4 d.p	M1A1 (2)
(d)	Using $f'(x)$ $\{= 3e^x - \frac{1}{2x}\}$ 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" [provided not just original]	B1
	Reflection in y-axis	B1√
	Intercepts correct	B1 (3)
(c)	$a = -2$, $b = -1$	B1 B1 (2)
(d)	Intersection of $y = 5x$ with $y = -x - 1$	M1 A1
	Solving to give $x = -\frac{1}{6}$	M1 A1 (4)

Question Number	Scheme	Marks
8. (a)	$2\sin(\theta+30)^{\circ} = \cos(\theta+60)^{\circ}$	
	$2\sin\theta^{\circ}\cos 30^{\circ} + 2\cos\theta^{\circ}\sin 30^{\circ} = \cos\theta^{\circ}\cos 60^{\circ} - \sin\theta^{\circ}\sin 60^{\circ}$	B1 B1
	$\frac{2\sqrt{3}}{2}\sin\theta^{\circ} + \frac{2}{2}\cos\theta^{\circ} = \frac{1}{2}\cos\theta^{\circ} - \frac{\sqrt{3}}{2}\sin\theta^{\circ}$	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$]$	M1
	$[\sin\theta = ½$ or $\sin\theta = -1]$	
	$\theta \rightarrow = \frac{\pi}{6}, \frac{5\pi}{6}$; [A1√ for $\pi - "\alpha"$]	A1, A1√
	$\theta \rightarrow \frac{3\pi}{2}$	A1 (5)
(iii)	LHS = $2\sin y\cos y\frac{\sin y}{\cos y} + (1 - 2\sin^2 y)$	B1 M1
	[B1 use of $\tan y = \frac{\sin y}{\cos y}$, M1 forming expression in $\sin y$, $\cos y$ only]	
	Completion: $= 2\sin^2 y + (1 - 2\sin^2 y) = 1$ AG	A1 (3) **[15]**
	[*Alternative*: LHS = $\frac{\sin 2y\sin y + \cos 2y\cos y}{\cos y}$	B1 M1
	$= \frac{\cos(2y - y)}{\cos y} = 1$]	A1