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Mark Scheme (Results)
Summer 2010

GCE O Level

GCE AO Level Pure Mathematics (7362/01)

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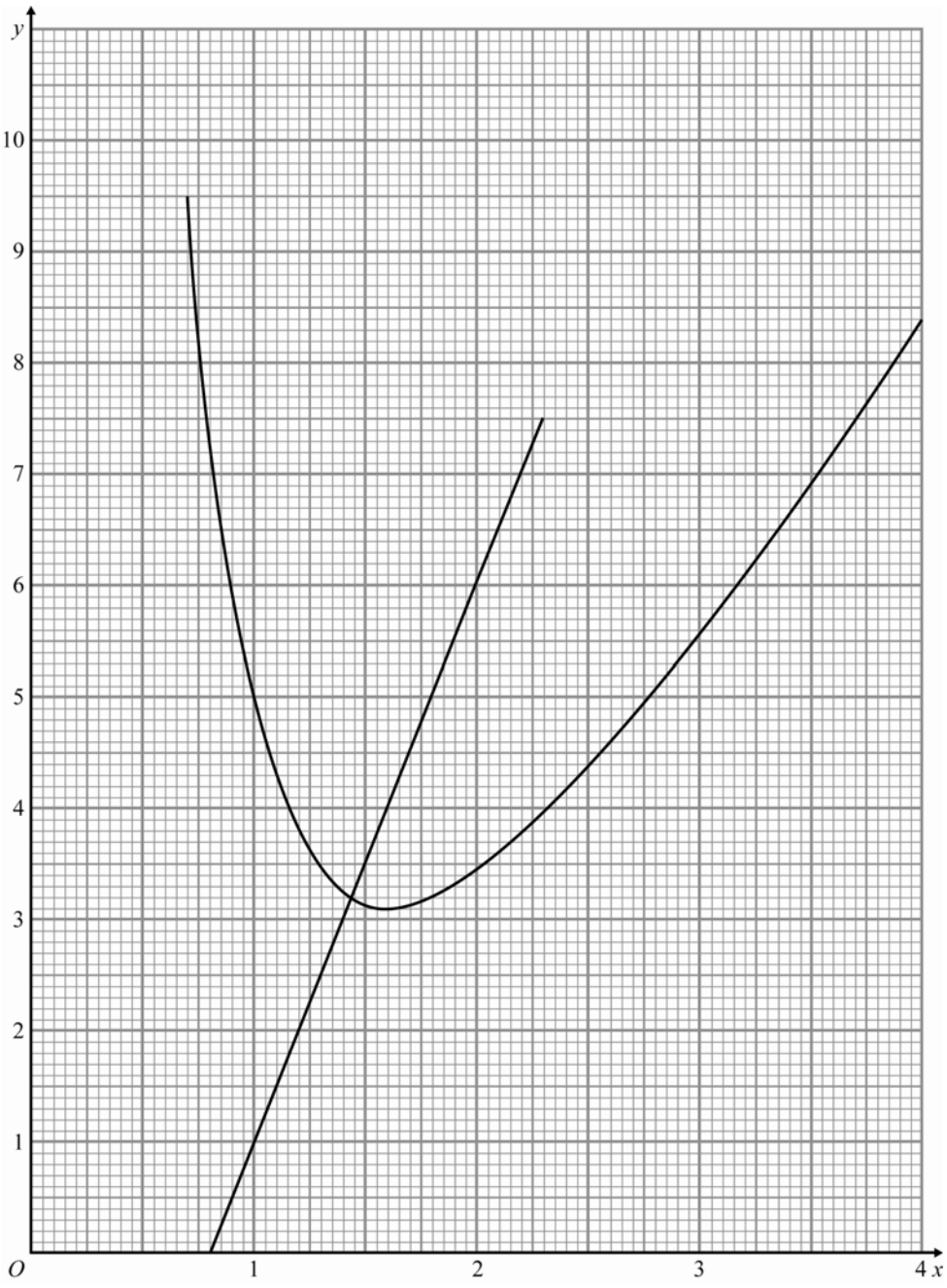
Summer 2010

Pure Mathematics 7362, Mark Scheme Summer 2010

Paper 1

Question Number	Scheme	Marks
1.	(a) $3x - 4 + \frac{6}{x^2} = 5x - 4$	M1
	$\frac{6}{x^2} = 2x$ $\quad x^3 = 3$	M1 A1

Question Number	Scheme	Marks
1.	(b) draw line $y = 5x - 4$ 	M1
	$\sqrt[3]{3} = 1.4$ or 1.5	A1
		[5]

Question Number	Scheme	Marks
2.	(a) $a = \frac{dv}{dt} = 6 - 2t$ (b) $a = 0 \quad t = 3$ $v_{\max} = 4 + 18 - 9 = 13$ (m/s)	M1 A1 M1 A1 **[4]**
3.	$x = 3 + 2y$ $2y^2 + 2y(3 + 2y) + (3 + 2y)^2 = 1$ $2y^2 + 6y + 4y^2 + 9 + 12y + 4y^2 - 1 = 0$ $10y^2 + 18y + 8 = 0$, $5y^2 + 9y + 4 = 0$ $(5y + 4)(y + 1) = 0$ $y = -\frac{4}{5} \quad x = \frac{7}{5}$ oe $y = -1 \quad x = 1$ *or* $y = \frac{x-3}{2}$ $2\left(\frac{x-3}{2}\right)^2 + 2x\left(\frac{x-3}{2}\right) + x^2 = 1$ $\frac{1}{2}(x^2 - 6x + 9) + x^2 - 3x + x^2 = 1$ $5x^2 - 12x + 7 = 0$ $(5x - 7)(x - 1) = 0$	M1 M1 A1 M1 A1 A1 **[6]**
4.	(a) $\cos\theta = \frac{8^2 + 6^2 - 5^2}{2 \times 8 \times 6}$ $\theta = 38.6°$ (b) Area $= \frac{1}{2} \times 6 \times 8 \sin 38.6$ $= 14.98... = 15\text{cm}^2$	B1 M1 A1 A1 M1 A1ft A1 **[7]**
5.	(a) $a = S_1 = 1 \times (2 + 1) = 3$ (b) $S_2 = 2 \times 5 = 10$ $3 + 3 + d = 10$ $d = 4$ (c) 25th term $= a + 24d = 3 + 96 = 99$ or $S_{25} - S_{24} = 25 \times 51 - 24 \times 49 = 99$	M1 A1 M1 M1 A1 M1 A1 **[7]**

Question Number	Scheme	Marks
6.	$y=0 \quad x^2=9 \quad x=(\pm)3$	B1
	$y=5 \quad 9-x^2=5 \quad x^2=4 \quad x=(\pm)2$	B1
	Vol of cylinder $=\pi\times5^2\times2$ or $\int_0^2 \pi 5^2 \mathrm{d}x \ (=50\pi)$	M1 A1
	Vol of rev $=\int_2^3 \pi y^2 dx=\pi\int_2^3 \left(9-x^2\right)^2 dx$	M1 A1
	$=\pi\int_2^3 \left(81-18x^2+x^4\right)dx$	
	$=\pi\left[81x-6x^3+\frac{1}{5}x^5\right]_2^3$	M1 A1
	$=\pi\left[243-162+\frac{243}{5}-\left(162-48+\frac{32}{5}\right)\right]=\pi\left[129.6-120.4\right]$	M1
	$=9.2\pi$	A1
	Req vol $=50\pi+9.2\pi=185.9...=186$	A1ft **[11]**

Question Number	Scheme	Marks
7.	(a) $\left(1+3x^2\right)^{-\frac{1}{2}} = 1+\left(-\frac{1}{2}\right)\left(3x^2\right)+\frac{\left(-\frac{1}{2}\right)\left(-\frac{3}{2}\right)}{2!}\left(3x^2\right)^2$	M1
	$+\frac{\left(-\frac{1}{2}\right)\left(-\frac{3}{2}\right)\left(-\frac{5}{2}\right)}{3!}\left(3x^2\right)^3+\ldots$	
	$=1-\frac{3}{2}x^2+\frac{27}{8}x^4-\frac{135}{16}x^6+\ldots$	A1 A1
	(b) $\lvert x\rvert < \frac{1}{\sqrt{3}}$ oe	B1
	(c) $\mathrm{f}(x)=\left(2+kx^2\right)\left(1-\frac{3}{2}x^2+\frac{27}{8}x^4-\frac{136}{16}x^6+\ldots\right)$	M1
	$=2-3x^2+\frac{27}{4}x^4-\frac{135}{8}x^6+kx^2-\frac{3}{2}kx^4+\frac{27}{8}kx^6+\ldots$	A1ft A1ft
	(d) $\frac{27k}{8}=\frac{135}{8}$, $k=\frac{135}{27}$, $k=5$	M1 A1
	(e) $\int_0^{0.3}\left(2+2x^2-\frac{3}{4}x^4\right)\mathrm{d}x$	
	$=\left[2x+\frac{2}{3}x^3-\frac{3}{20}x^5\right]_0^{0.3}$	M1 A1ft
	$=2\times0.3+\frac{2}{3}(0.3)^3-\frac{3\times(0.3)^5}{20}=0.6176$	M1 A1
		[13]

Question Number	Scheme	Marks
8.	(a) $5^x = 625 \quad x = 4$	M1 A1
	(b) $5y + 3 = 3^5 \quad 5y + 3 = 243 \quad y = 48$	M1 A1
	(c)(i) $(5x+3)\ln x - 2(5x+3)$ $= (5x+3)(\ln x - 2)$	M1 A1
	(ii) $x = -\frac{3}{5}$ not possible	B1
	$\ln x = 2 \quad x = e^2$	M1 A1
	(d) $\log_p q + \frac{3}{\log_p q} = 4$ $(\log_p q)^2 - 4\log_p q + 3 = 0$ $(\log_p q - 3)(\log_p q - 1) = 0$ $\log_p q = 3 \quad p^3 = q$ $(\log_p q = 1 \quad q = p$ not allowed$)$ $pq = 81 \quad p^4 = 81 \quad p = 3 \quad q = 27$ *or* $\frac{1}{\log_q p} + 3\log_q p = 4$ $3(\log_q p)^2 - 4\log_q p + 1 = 0$ $(3\log_q p - 1)(\log_q p - 1) = 0$ $\log_q p = \frac{1}{3}, \ q^{\frac{1}{3}} = p, \ q = p^3$ $(\log_q p = 1 \quad q = p$ not allowed$)$ $pq = 81 \quad p^4 = 81 \quad p = 3 \quad q = 27$	M1 M1 A1 M1 A1 **[14]**

Question Number	Scheme	Marks
9.	(a) $f(x)=(x+3)(x+1)(x-2)$ $=x^3+2x^2-5x-6$ $a=2,\ b=-5,\ d=-6$	M1 A1 A1 A1
	(b) $\frac{dy}{dx}=3x^2+4x-5$ $x=-2 \quad \frac{dy}{dx}=3(-2)^2+4(-5)=-1$ $y=(-2)^3+2(-2)^2-5(-2)-6=4$ tgt: $y-4=-1(x+2) \quad y=-x+2$	M1 A1ft B1ft M1 A1
	(c) R is $(2,0)$ $x=2, y=0 \quad \therefore y+x=2$ ie l passes through R	B1
	(d) area $=\int_{-2}^{2}\left((2-x)-\left(x^3+2x^2-5x-6\right)\right)dx$ $=\int_{-2}^{2}\left(8+4x-2x^2-x^3\right)dx$ $=\left[8x+2x^2-\frac{2}{3}x^3-\frac{1}{4}x^4\right]_{-2}^{2}$ $=\left(16+8-\frac{16}{3}-4\right)-\left(-16+8+\frac{16}{3}-4\right)=21\frac{1}{3}$ (accept 21.3)	M1 M1 A1ft M1 A1 **[15]**

Question Number	Scheme	Marks
10.	(a) $\text{grad } PQ = \frac{5-3}{4-1} = \frac{2}{3}$	M1 A1
	$\text{grad } QR = \frac{2-5}{6-4} = -\frac{3}{2}$	A1
	(b) $\frac{2}{3} \times -\frac{3}{2} = -1$	M1
	product of gradients $= -1$ $\therefore$ perpendicular	A1
	(c) $PQ^2 = (5-3)^2 + (4-1)^2 = 4 + 9 = 13$	M1
	$PQ = \sqrt{13}$	A1
	(d) Midpoint is $\left(3\frac{1}{2}, 2\frac{1}{2}\right)$	B1
	$\text{grad PR} = \frac{3-2}{1-6} = -\frac{1}{5}$	M1
	grad perp $= 5$	A1
	eqn perp : $y - 2\frac{1}{2} = 5\left(x - 3\frac{1}{2}\right)$	B1
	(e) $5 - 2\frac{1}{2} = 5\left(4 - 3\frac{1}{2}\right) = 2\frac{1}{2}$	B1
	$\therefore Q$ lies on l	
	(f) $y = 0$ $x = 3\frac{1}{2} = -\frac{1}{2}$ S is $(3,0)$	B1
	$PQ = \sqrt{13}$	
	$QR = \sqrt{3^2 + 2^2}$, $PS = \sqrt{2^2 + 3^2}$, $RS = \sqrt{3^2 + 2^2} = \sqrt{13}$	M1 A1
	equal sides and a right angle at Q $\therefore$ square	A1
	(g) Area square $= \sqrt{13} \times \sqrt{13} = 13$	
	$\therefore$ area $\Delta PQR = 6\frac{1}{2}$	M1 A1
		[18]

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