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Mark Scheme (Results)
Summer 2007

GCE

O Level Mathematics B (7361_01)

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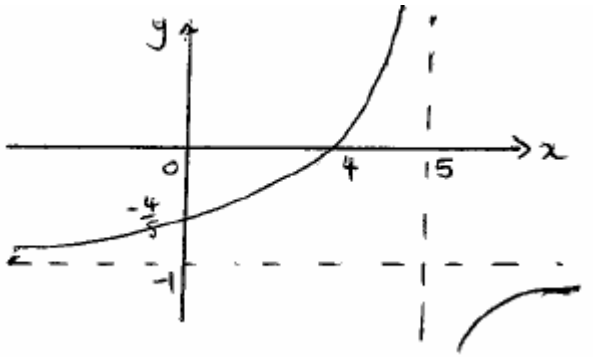
Pure Mathematics 7362

Paper 1

Q.	Scheme	Marks
1	$\text{Vol} = \int_2^4 \pi y^2 \mathrm{d}x = \pi \int_2^4 16x \mathrm{d}x = \pi \left[8x^2 \right]_2^4$ $= 8\pi(16-4) = 96\pi \text{ units}^3$	M1A1 M1A1 (4)
2	$v = \frac{\mathrm{d}s}{\mathrm{d}t} = 2\cos t - 2t\sin t + 2t$ $t = 3 \quad v = 2\cos 3 - 6\sin 3 + 6 = 3.17$ m/s	M1A2,1,0 M1A1 (5)
3	(a) (i) $y = -1$ (ii) $x = 5$ (b) $\left(0, -\frac{4}{5}\right)$ $(4, 0)$  	B1B1 B1B1 G1(2 branches) G1 Ö (asy) G1 Ö (crossing points) (7)
4	(a) $y - 2 = \frac{7}{24}(x-3)$ $24y - 48 = 7x - 21 \qquad 24y = 7x + 27$ (b) $24 \times 9 = 7b + 27 \quad 7b = 189 \quad b = 27$ (c) length $AB = \text{Ö}\left((b-3)^2 + (2-9)^2\right), = \text{Ö}\left(24^2 + 7^2\right) = 25$	M1A1 A1 M1A1 M1A1A1 (8)
5	(a) x: 0, **1**, 0.5, 1.03, **1.0**, **1.15**, 1.5, 1.37, 2.0, 1.72, **2.5**, **2.24**, 3, 2.98, 3.5, **4.00**, 4.0, 5.39 (b) Graph (c) (i) $2\mathrm{e}^{\frac{1}{2}x} = x + 3 \quad \mathrm{e}^{\frac{1}{2}x} - \frac{1}{2}x = 1.5$, $y = 1.5 \quad x = 1.7$ (ii) $x = 2\ln\left(2 + \frac{1}{2}x\right) \quad \mathrm{e}^{\frac{1}{2}x} = 2 + \frac{1}{2}x$, $\mathrm{e}^{\frac{1}{2}x} - \frac{1}{2}x = 2$ $y = 2 \quad x = 2.3$	B2,1,0 G2 M1,A1 M1,A1 A1 (9)

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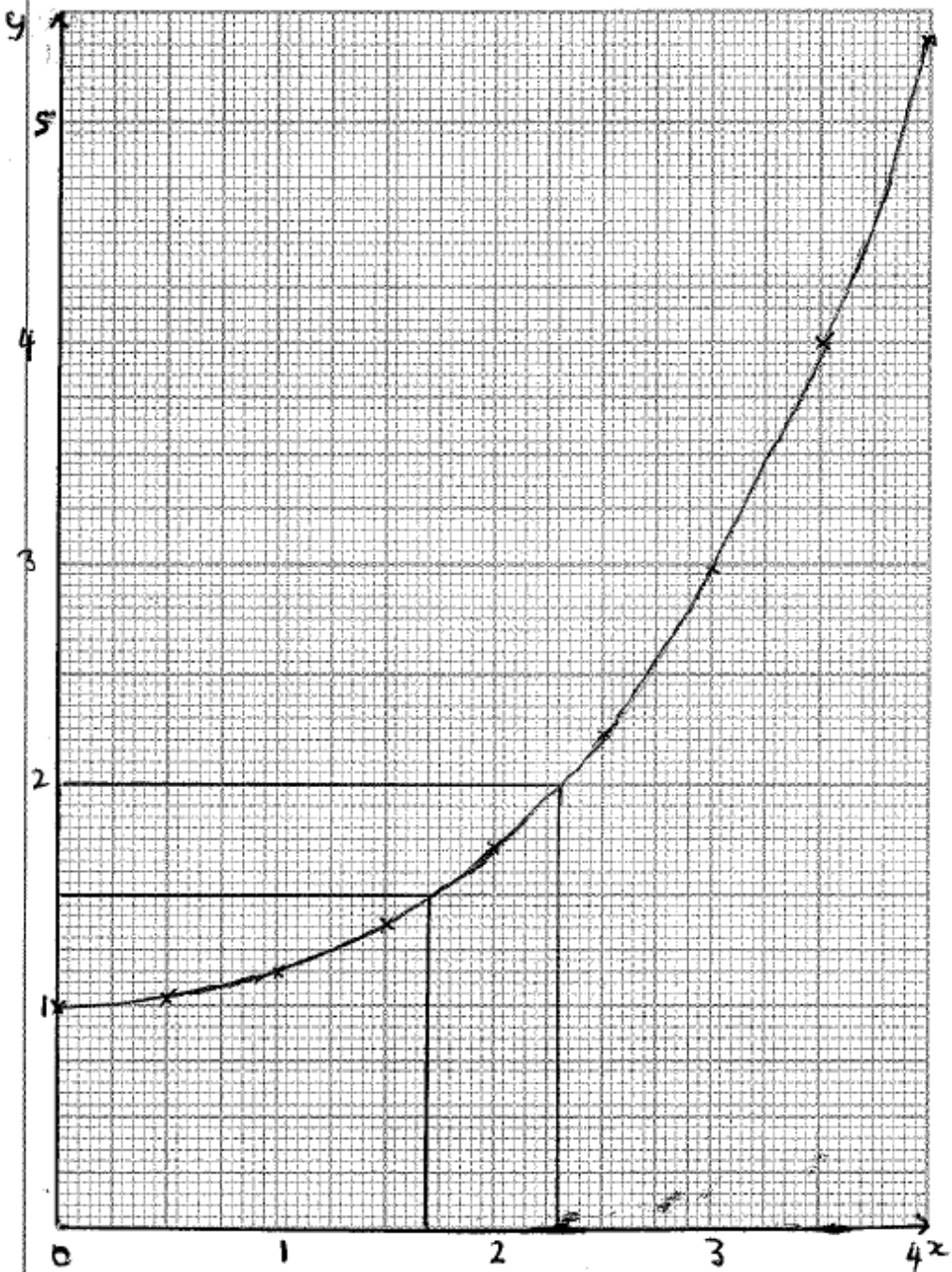
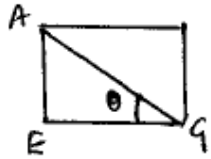
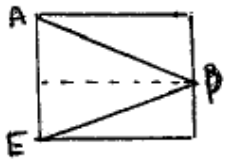
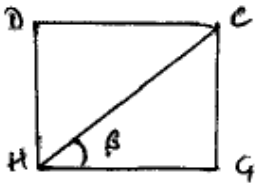
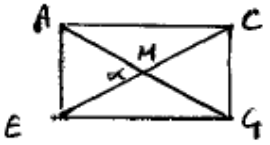
Question 5 continued



Q5

(Total 9 marks)

6	(a) $1+\frac{1}{5}(5x)+\frac{\left(\frac{1}{5}\right)\left(-\frac{4}{5}\right)}{2!}(5x)^2+\frac{\left(\frac{1}{5}\right)\left(-\frac{4}{5}\right)\left(-\frac{9}{5}\right)}{3!}(5x)^3$	M1
	$+\frac{\left(\frac{1}{5}\right)\left(-\frac{4}{5}\right)\left(-\frac{9}{5}\right)\left(-\frac{14}{5}\right)}{4!}(5x)^4=1+x-2x^2+6x^3-21x^4$	A2,1,0
	(b) $\left(1+\frac{5}{32}\right)^{\frac{1}{5}}=\left(\frac{37}{32}\right)^{\frac{1}{5}}=\frac{1}{2}\sqrt[5]{37}$	M1A1
	(c) $\frac{1}{2}\sqrt[5]{37}=1+\frac{1}{32}-2\left(\frac{1}{32}\right)^2+6\left(\frac{1}{32}\right)^3-21\left(\frac{1}{32}\right)^4=(1.029459...)$	M1
	$\sqrt[5]{37}=2.05892$	A1
	(d) % error $=\frac{\sqrt[5]{37}-2.05892}{\sqrt[5]{37}}\times 100,=0.0002\%$	M1A1,A1 (10)
7	(a) $3\cos\theta=-1 \quad \cos\theta=-\frac{1}{3} \quad \theta=1.91^c$	M1A1
	$(\sin\theta=-3$ no solutions$)$	
	(b) $2\theta+\frac{\pi}{6}=1.249,\ 4.390, \quad 2\theta=0.7254,\ 3.867$	M1A1
	$\theta=0.363^c,\ 1.93^c$	A1A1
	(c) $5\left(1-\cos^2\theta\right)-8\cos\theta-1=0, \quad 5\cos^2\theta+8\cos\theta-4=0$	M1,M1
	$(5\cos\theta-2)(\cos\theta+2)=0 \quad \cos\theta=0.4, \quad \theta=1.16$	M1A1,A1
	$\cos\theta=-2, \quad$ no solutions	(11)
8	(a) $a+14d=46$	M1
	$10(2a+19d)=650$	A1
	$2a+19d=65 \quad 2a+28d=92 \quad 9d=27 \quad d=3$	M1A1
	(b) $a+3\times 14=46 \quad a=4$	M1A1
	(c) $\frac{n}{2}(8+3(n-1))>1000$	M1
	$n(5+3n)>2000 \quad 3n^2+5n-2000>0$	M1
	$(3n+80)(n-25)>0 \quad n>25$ (or $n<-\frac{80}{3}$)	M1
	$\therefore$ least no. of terms is 26	A1
	(d) $S_{40}=20(8+39\times 3)=2500$	M1
	$S_{30}=15(8+29\times 3)=1425$	A1
	Sum of last 10 terms $=1075$	A1 (13)

9	(a) $AG^2 = \sqrt{\left(4^2+5^2+8^2\right)} = \sqrt{105} = 10.24... = 10.2$ cm	M1A1
	(b)  $\sin\theta = \frac{4}{AG}$ $\theta = 22.97... = 23.0°$	B1M1A1
	(c)  $\tan\frac{1}{2}\phi = \frac{2}{8}$ $\phi = 28.1°$	B1M1A1
	(d)  $\tan\beta = \frac{4}{5}$ β=38.7°	B1M1A1
	(e)  $AM = \frac{1}{2}\sqrt{105}$ $\sin\frac{1}{2}\alpha = \frac{2}{\frac{1}{2}\sqrt{105}}$ α=45.95...=46.0°	B1M1A1 Ö A1 (15)
10	(a) $0 = k+21-27$ $k=6$	M1A1
	(b) $0 = 6+7x-x^3$ $(3-x)\left(2+3x+x^2\right)=0$	
	$(3-x)(2+x)(1+x)=0$	M1
	P is $(-2,0)$ Q is $(-1,0)$	A1A1
		B1
	(c) S is $(0,6)$	
	Grad. $PS = \frac{6}{2} = 3$ Eqn. PS: $y = 3x+6$	M1A1
	(d) $6+7x-x^3 = 3x+6$ $x^3-4x=0$ $x=0$ $x=\pm 2$	M1M1
	T is $(2,12)$	A1
	(e) Area $\Delta PSO = \frac{1}{2}\times 2\times 6 = 6$	B1
	$\int_{-1}^{0}\left(6+7x-x^3\right)\mathrm{d}x = \left[6x+\frac{7}{2}x^2-\frac{1}{4}x^4\right]_{-1}^{0}$	M1A1
	$= 0-\left(-6+\frac{7}{2}-\frac{1}{4}\right) = 2\frac{3}{4}$	M1
	$\int_{-2}^{-1}\left(6+7x-x^3\right)\mathrm{d}x = -2\frac{3}{4}-\left(-12+14-4\right) = -\frac{3}{4}$	M1
	Reqd. area $= \frac{3}{4}+6-2\frac{3}{4} = 4$	M1A1 (18)