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Mark Scheme (Results)
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GCE O Level

AO Level Pure Mathematics (7362) Paper 1

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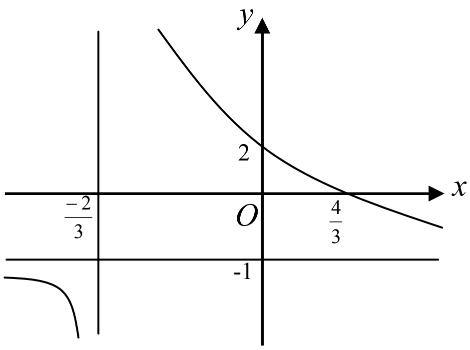
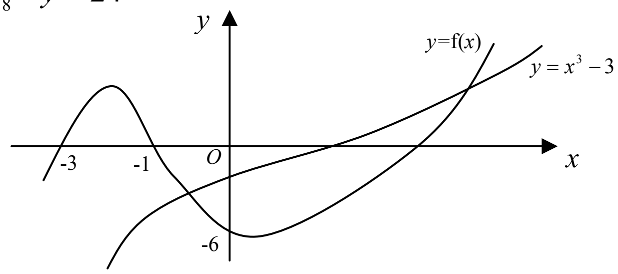
Pure Mathematics 7362

Paper 1

Q.	Scheme	Marks
1	$\frac{\sin 32}{4.6} = \frac{\sin C}{6.3}, \quad \sin C = \frac{6.3 \sin 32}{4.6}$ $C = 46.5°, \quad 133.5°$	M1,M1 A1A1ft (4)
2	$A = \pi r^2 \qquad \frac{da}{dr} = 2\pi r$ $\delta A \approx 2\pi r \delta r$ $\frac{\delta A}{A} \approx \frac{2\pi r \delta r}{\pi r^2}$ $\frac{\delta r}{r} \approx \frac{1}{2}\frac{\delta A}{A}$ $\frac{\delta a}{A} = x\ \% \qquad \therefore \frac{\delta r}{r} = \frac{1}{2} x\ \%$	B1 M1 M1 M1A1 (5)
3	(a) $\frac{dy}{dx} = 3x^2 - 8x - 2$ Grad tgt at A: $3a^2 - 8a - 2 = 1 \qquad 3a^2 - 8a - 3 = 0$ $(3a+1)(a-3) = 0$ $\left(a = -\frac{1}{3}\right) \quad a = 3$ $b = 3^3 - 4 \times 9 - 6 + 10 = -5$ (b) $y + 5 = x - 3$	M1 M1 M1 A1 A1 (5) B1 (1)
4	(a) $\frac{dy}{dx} = 12x^2 \cos 3x - 3(4x^3 - 5)\sin 3x$ (b) $\frac{dy}{dx} = \frac{2e^{2x}(3x^2 - x) - (6x - 1)e^{2x}}{(3x^2 - x)^2}$	M1A2,1,0 (3) M1A2,1,0 (3)
5	(a) (i) $y = -1$ (ii) $x = -\frac{2}{3}$ (b) (i) $y = 0 \quad 4 - 3x = 0 \quad (\frac{4}{3}, 0)$ (ii) $x = 0 \quad y = 2 \quad (0, 2)$ (c) 	B1B1 (2) B1 B1 (2) G1 G1ft G1ft (3)

6	(a) $V=(80-2x)(50-2x)x$ $=4000x-260x^2+4x^3$ *	M1 A1 (2)
	(b) $\frac{dV}{dx}=4000-520x+12x^2$ $0=3x^2-130x+1000$ $0=(3x-100)(x-10)$ $x=\frac{100}{3}$(not poss) or $x=10$ $\frac{d^2V}{dx^2}=-520+24x$ $x=10$ $\frac{d^2V}{dx^2}=-520+240<0$ $\therefore$ Max.	M1 M1A1 M1M1A1 (6)
	(c) $V_{max}=(80-20)(50-20)=18000$	M1A1 (2)
7	(a) (i) $\overrightarrow{AD}=\frac{1}{4}\mathbf{b}-\mathbf{a}$ (ii) $\overrightarrow{OE}=\frac{1}{4}\mathbf{b}-\frac{1}{3}\left(\frac{1}{4}\mathbf{b}-\mathbf{a}\right)=\frac{1}{3}\mathbf{a}+\frac{1}{6}\mathbf{b}$ (iii) $\overrightarrow{BE}=\frac{1}{3}\mathbf{a}-\frac{5}{6}\mathbf{b}$	B1 M1A1 B1 (4)
	(b) $\overrightarrow{BF}=-\mathbf{b}+\mu\mathbf{a}$ $\overrightarrow{BE}=\frac{1}{3}\mathbf{a}-\frac{5}{6}\mathbf{b}$, $\therefore F,E,B$ collinear when $\overrightarrow{BF}=\frac{6}{5}\overrightarrow{BE}$ $\therefore \mu=\frac{6}{5}\times\frac{1}{3}=\frac{2}{5}$	M1 M1A1 A1 (4)
	(c) $\overrightarrow{EG}=-\frac{2}{3}\left(-\mathbf{a}+\frac{1}{4}\mathbf{b}\right)+\lambda(-\mathbf{a}+\mathbf{b})=\left(\frac{2}{3}-\lambda\right)\mathbf{a}+\left(\lambda-\frac{1}{6}\right)\mathbf{b}$ DB parallel to EG $\overrightarrow{DB}=\frac{3}{4}\mathbf{b}$ $\therefore \lambda=\frac{2}{3}$	M1A1 M1A1 (4)
8	(a) $\cos 2\theta=\cos^2\theta-\sin^2\theta$ $=(1-\sin^2\theta)-\sin^2\theta$ $=\cos^2-(1-\cos^2\theta)$ $2\sin^2\theta=1-\cos 2\theta$ $2\cos^2\theta=\cos 2\theta+1$ $\sin^2\theta=\frac{1}{2}(1-\cos 2\theta)$ * $\cos^2\theta=\frac{1}{2}(\cos 2\theta+1)$ *	M1 M1 A1A1 (4)
	(b) $8\sin^4\theta-2\sin^2\theta-2=8\times\frac{1}{4}(1-\cos 2\theta)^2-2\times\frac{1}{2}(1-\cos 2\theta)-2$ $=2(1-2\cos 2\theta+\cos^2 2\theta)-1+\cos 2\theta-2$ $=2-4\cos 2\theta+2\times\frac{1}{2}(\cos 4\theta+1)-3+\cos 2\theta$ $=\cos 4\theta-3\cos 2\theta$ *	M1 M1 M1 A1 (4)
	(c) $\cos 4\theta-3\sin 2\theta+2+3\cos 2\theta=2.5$ $\cos 4\theta=0.5$ $4\theta=\frac{\pi}{3},\frac{5\pi}{3},$ $\theta=\frac{\pi}{12},\frac{5\pi}{12}$	M1 M1A1A1 (4)
	(d) $\int_0^{\frac{\pi}{2}}(4\sin^4\theta-\sin^2\theta+\cos\theta)\,d\theta$ $=\int_0^{\frac{\pi}{2}}\left(\frac{1}{2}(\cos 4\theta-3\cos 2\theta)+1+\cos\theta\right)d\theta$ $=\left[\frac{1}{8}\sin 4\theta-\frac{3}{4}\sin 2\theta+\theta+\sin\theta\right]_0^{\frac{\pi}{2}}$ $=\left(\frac{\pi}{2}+\sin\frac{\pi}{2}\right)-0=\frac{\pi}{2}+1$	M1 M1A1 A1 (4)

9	(a) $a=(x-1) \quad ar^2=3x \quad ar^4=(10x+8)$ $r^2=\frac{3x}{x-1}=\frac{10x+8}{3x}$ $9x^2=10x^2-2x-8 \quad x^2-2x-8=0$ $(x-4)(x+2)=0 \quad x=4, \quad x=-2$ (b) Pos terms $\Rightarrow x=4 \quad a=3$ (c) $ar^2=12 \quad r^2=4 \quad r=2$ (d) $S_8=\dfrac{a(r^8-1)}{(r-1)}=\dfrac{3(2^8-1)}{(2-1)}=765$ (e) $a=(x-1)=3 \quad a+5d=48 \quad d=9$ (f) $T_n=\frac{n}{2}(6+9(n-1))=\frac{n}{2}(9n-3)$ $\frac{n}{2}(9n-3)>765$ $9n^2-3n-1530>0 \quad 3n^2-n-510>0$ Crit values $n=\dfrac{1\pm\sqrt{(1+4\times3\times510)}}{6}=13.2 \quad (n>0)$ least $n=14$	M1A1 M1A1 (4) B1 (1) M1A1 (2) M1A1 (2) M1A1 (2) M1 M1 M1A1 A1 ft (5)
10	(a) $8+4p-2q-6=0$ $-27+9p+3q-6=0$ $2p-q=-1$ $3p+q=11 \quad p=2, \quad q=5$ (b) $\mathrm{f}(x)=(x-2)(x+3)(x+1)$ (c) $x^3-3=x^3+2x^2-5x-6$ $2x^2-5x-3=0$ $(2x+1)(x-3)=0$ $x=-\frac{1}{2} \quad x=3$ $y=-3\frac{1}{8} \quad y=24$ (d)  (f) $\int_{-\frac{1}{2}}^{3}(x^3-3)-(x^3+2x^2-5x-6)\,\mathrm{d}x$ $=\int_{-\frac{1}{2}}^{3}(-2x^2+5x+3)\,\mathrm{d}x$ $=\left[-\frac{2}{3}x^3+\frac{5}{2}x^2+3x\right]_{-\frac{1}{2}}^{3}$ $=\left(-18+\frac{45}{2}+9\right)-\left(\frac{2}{24}+\frac{5}{8}-\frac{3}{2}\right)=14\frac{7}{24} \quad$ or $\left(\frac{343}{24}\right)$	M1 A1 M1A1 (4) B1 (1) M1 M1 A1A1 (4) (i) G1 G2,1,0 (3) (ii) G1 (1) M1 M1A1 M1A1 (5)