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GCE O Level

AO Level Pure Mathematics (7362) Paper 2

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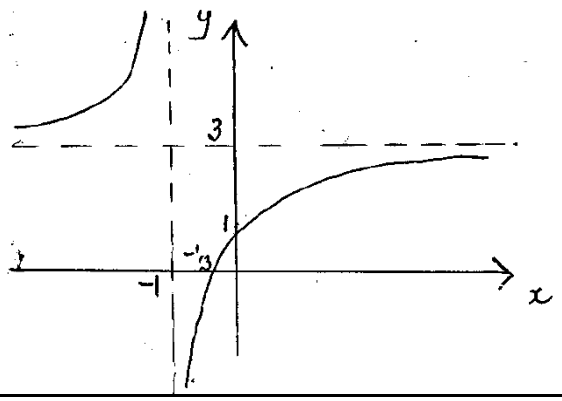
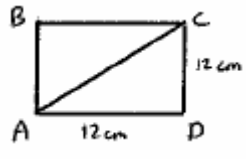
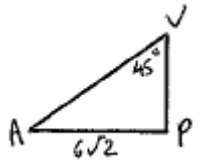
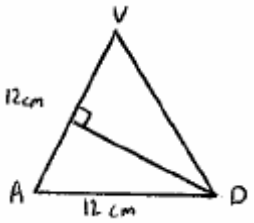
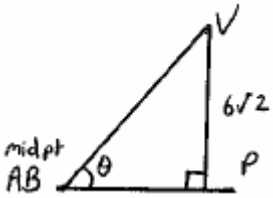
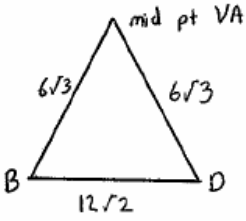
Pure Mathematics 7362

Paper 2

1	$b^2-4ac>0 \quad 4p^2-4(10-3p)>0$ $4p^2+12p-40>0 \qquad p^2+3p-10>0$ $(p+5)(p-2)>0$ crit. values $p=-5 \;\; p=2$ $p<-5 \;\; p>2$	M1 M1A1 A1ft (4)
2	$\sum_{r=5}^{195} r-\sum_{r=1}^{39} 5r$ $=\frac{191}{2}(5+195)-5\times\frac{39}{2}(1+39), \qquad =19100-3900=15200$	M1A1 M1A1,A1 (5)
3	Grad. line $=\frac{12}{-6}=-2$ Grad. perp. $=\frac{1}{2}$ Mid pt. is $(8, 3)$ Eqn. perp. $y-3=\frac{1}{2}(x-8) \quad 2y=x-2$	M1 A1 B1 M1A1 (5)
4	$y=0 \quad x^2=9 \quad x=\pm 3$ $V=\int_{-3}^{3}\pi y^2\,\mathrm{d}x=\int_{-3}^{3}\pi\left(9-x^2\right)^2\,\mathrm{d}x=\pi\int_{-3}^{3}\left(81-18x^2+x^4\right)\mathrm{d}x$ $=\pi\left[81x-6x^3+\frac{x^5}{5}\right]_{-3}^{3}$ $=\pi\left[\left(81\times 3-6\times 27+\frac{3^5}{5}\right)-\left(-81\times 3+6\times 3^3-\frac{3^5}{5}\right)\right]=814$	B1 M1 M1A1 M1A1 (6)
5	(a) $v=t^2-2t+9 \quad \frac{\mathrm{d}v}{\mathrm{d}t}=2t-2$ $t=3$ accel. $=4\mathrm{m/s}^2$ (b) $s=\int\left(t^2-2t+9\right)\mathrm{d}t=\left[\frac{t^3}{3}-t^2+9t\right]_0^6$ $=72-36+54=90\mathrm{m}$	M1 A1 (2) M1A1 M1A1 (4)
6	(a) (i) $y=3$ (ii) $x=-1$ (b) (i) $y=0 \quad 3=\frac{2}{x+1} \quad x=-\frac{1}{3} \;\; \left(-\frac{1}{3}, 0\right)$ (ii) $x=0 \;\; y=1 \quad (0, 1)$ (c)  	B1B1 (2) B1 B1 (2) G1 G1ft G1ft (3)

7	(a) $\alpha+\beta=-k \quad \alpha\beta=-5$	B1
	$\alpha^2+\beta^2=(\alpha+\beta)^2-2\alpha\beta=k^2+10$	M1A1
	$\alpha^2\beta^2=25$	B1 (4)
	(b) $5(k^2+10)-7\times25=0$	M1
	$5k^2=175-50$	
	$k^2=25 \quad k=\pm5$	A1 (2)
	(c) $k=5 \quad \frac{1}{\alpha^2}+\frac{1}{\beta^2}=\frac{\alpha^2+\beta^2}{\alpha^2\beta^2}=\frac{25+10}{25}=\frac{7}{5}$	M1A1
	$\frac{1}{\alpha^2\beta^2}=\frac{1}{25}$	B1
	Eqn. $x^2-\frac{7}{5}x+\frac{1}{25}=0$	M1
	$25x^2-35x+1=0$	A1 (5)
8	(a) $\sin\theta=\frac{1}{4}$ ($\sin\theta=-\frac{5}{2}$ not poss.)	M1
	$\theta=0.253, \quad 2.89$	A1A1 (3)
	(b) $(2\theta-\frac{\pi}{3})=1.176, \quad 4.317$	M1
	$2\theta=2.223, \quad 5.364$	M1
	$\theta=1.11, \quad 2.68$	A1A1 (4)
	(c) $9(1-\cos^2\theta)-9\cos\theta=11$	M1
	$9\cos^2\theta+9\cos\theta+2=0$	
	$(3\cos\theta+1)(3\cos\theta+2)=0 \quad \cos\theta=-\frac{1}{3}, \quad \cos\theta=-\frac{2}{3}$	M1A1
	$\theta=1.91, \quad \theta=2.30$	A1,A1 (5)
9	(a) $a+2d=\log pq^4 \quad a+4d=\log pq^8$	M1
	$2d=\log pq^8-\log pq^4$	M1
	$=\log\frac{pq^8}{pq^4}=\log q^4=4\log q \qquad d=2\log q \quad b=2$	A1 (3)
	(b) $a=\log pq^4-4\log q=\log\frac{pq^4}{q^4}=\log p$	M1A1 (2)
	(c) $S_n=\frac{n}{2}\{2\log p+2(n-1)\log q\}$	M1A1
	$=n\{\log pq^{n-1}\} \quad s=n \quad r=n-1$	M1A1 (4)
	(d) $S_{16}=16\log pq^{15} \qquad S_4=4\log pq^3$	
	$16\log pq^{15}=40\log pq^3$	M1A1ft
	$2\log p+30\log q=5\log p+15\log q$	
	$3\log p=15\log q, \qquad \log p=5\log q$	M1A1 (4)

10	(a) $\left(1+\frac{x}{2}\right)^{\frac{1}{5}} = 1+\left(\frac{1}{5}\right)\left(\frac{x}{2}\right)+\frac{\left(\frac{1}{5}\right)\left(-\frac{4}{5}\right)}{2!}\left(\frac{x}{2}\right)^2$ $= 1+\frac{x}{10}-\frac{x^2}{50}$	M1 A2,1,0 (3)
	(b) $\left(1-\frac{x}{2}\right)^{-\frac{1}{5}} = 1+\left(-\frac{1}{5}\right)\left(-\frac{x}{2}\right)+\frac{\left(-\frac{1}{5}\right)\left(-\frac{6}{5}\right)}{2!}\left(-\frac{x}{2}\right)^2$ $= 1+\frac{x}{10}+\frac{3x^2}{100}$	M1 A2,1,0 (3)
	(c) $\lvert x\rvert < 2$	B1 (1)
	(d) $\left(\frac{2+x}{2-x}\right)^{\frac{1}{5}} = \left(\frac{1+\frac{x}{2}}{1-\frac{x}{2}}\right)^{\frac{1}{5}} = \left(1+\frac{x}{10}-\frac{x^2}{50}\right)\left(1+\frac{x}{10}+\frac{3x^2}{100}\right)$ $= 1+\frac{x}{5}+\frac{x^2}{50}$	M1 M1A1 (3)
	(e) $\int_0^{0.5}\left(\frac{2+x}{2-x}\right)^{\frac{1}{5}}\mathrm{d}x = \int_0^{0.5}\left(1+\frac{x}{5}+\frac{x^2}{50}\right)\mathrm{d}x$ $= \left[x+\frac{x^2}{10}+\frac{x^3}{150}\right]_0^{0.5}$ $= 0.5+\frac{0.5^2}{10}+\frac{0.5^3}{150} = 0.5258$	M1A1ft M1A1 (4)

11	(a)		$AC = \sqrt{(12^2 + 12^2)} = 12\sqrt{2}$ $VP = 6\sqrt{2}\tan 45 = 6\sqrt{2}$	M1A1 M1A1 (4)
	(b)		$VA^2 = \left(6\sqrt{2}\right)^2 + \left(6\sqrt{2}\right)^2 = 144$ $VA = 12\text{ cm}$	M1A1ft A1 (3)
	(c)		$DX^2 = 12^2 - 6^2$ $DX = \sqrt{108} = 6\sqrt{3}$	M1A1 A1 (3)
	(d)		$\tan\theta = \frac{6\sqrt{2}}{6}$ $\theta = 54.7°$	M1A1A1 (3)
	(e)		Identify the angle $\cos\phi = \frac{\left(6\sqrt{3}\right)^2 + \left(6\sqrt{3}\right)^2 - \left(12\sqrt{2}\right)^2}{2 \text{ x } 6\sqrt{3} \text{ x } 6\sqrt{3}}$ $= -\frac{1}{3}$ $\phi = 109.5°$	B1 M1A1ft A1 (4)