Mark Scheme 4752
June 2006

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Section A

1	1, 3	1,1		2	
2	$r = 0.2$	3	M1 for $10 = 8/(1 - r)$, then M1 dep't for any correct step	3	
3	$1/\sqrt{15}$ i.s.w. not +/–	3	M2 for $\sqrt{15}$ seen M1 for rt angled triangle with side 1 and hyp 4, or $\cos^2\theta = 1 - 1/4^2$.	3	
4	$x^5/5 - 3x^{-1}/-1 + x$ [value at 2 – value at 1] attempted 5.7 c.a.o.	B3 M1 A1	1 each term dep't on B2	5	
5	$[y =] 3x - x^3/3 + c$ subst of (6, 1) in their eqn with c $y = 3x - x^3/3 + 55$ c.a.o	B1 B1 M1 A1	 Dep't on integration attempt Dep't on B0B1 Allow $c = 55$ isw	4	17
6	(i) 3, 8, 13, 18 (ii) use of $n/2[2a + (n - 1)d]$ $(S_{100} =)$ 25 050 or $(S_{50} =)$ 6275 $(S_{49} =)$ 6027 or $(S_{51} =)$ 6528 their$(S_{100} - S_{50})$ dep't on M1 18 775 cao	B1 M1 A1 M1 A1	Ignore extras Use of $a + (n - 1)d$ $u_{51} = 253$ $u_{100} = 498$ $u_{50} = 248$ $u_{52} = 258$ $50/2(\text{their}(u_{51} + u_{100}))$ dep't on M1 or $50/2[2 \times \text{their}(u_{51}) + 49 \times 5]$	5	
7	(i) sketch of correct shape correct period and amplitude period halved for $y = \cos 2x$; amplitude unchanged (ii) 30, 150, 210, 330	G1 G1 G1 B2	Not ruled lines need 1 and –1 indicated; nos. on horiz axis not needed if one period shown B1 for 2 of these, ignore extras outside range.	5	
8	$\sqrt{x} = x^{½}$ soi $18x^2$, $½ x^{-½}$ $36x$ $Ax^{-3/2}$ (from $Bx^{-½}$)	B1 B1B1 B1 B1	 –1 if d/dx(3) not = 0 any A,B	5	
9	$3x \log 5 = \log 100$ $3x = \log 100/\log 5$ $x = 0.954$	M1 M1 A2	allow any or no base or $3x = \log_5 100$ dep't A1 for other rot versions of 0.9537... SC B2/4 for 0.954 with no log wkg SC B1 r.o.t. 0.9537...	4	19

Section B

10	**i** (*A*)	$5.2^2 + 6.3^2 - 2\times5.2 \times 6.3 \times\cos$ "57"	M2	M1 for recognisable attempt at cos rule. or greater accuracy		
		ST = 5.6 or 5.57 cao	A1		3	
	i (*B*)	sin T/5.2 = sin(their 57)/their ST	M1	Or sin S/6.3 = … or cosine rule		
		T=51 to 52 or S = 71 to 72	A1			
		bearing 285 + their T or 408 – their S	B1	If outside 0 to 360, must be adjusted	3	
	ii	5.2θ, $24 \times 26/60$	B1B1			
		θ = 1.98 to 2.02	B1	Lost for all working in degrees		
		θ = their $2 \times 180/\pi$ or 114.6°...	M1	Implied by 57.3		
		Bearing = 293 to 294 cao	A1		5	11
11	**i**	$y' = 3x^2 - 6x$	B1	condone one error		
		use of $y' = 0$	M1			
		(0, 1) or (2, –3)	A2	A1 for one correct or x = 0 , 2 SC B1 for (0,1) from their y'		
		sign of y'' used to test or y' either side	T1	Dep't on M1 or y either side or clear cubic sketch	5	
	ii	$y'(-1) = 3 + 6 = 9$	B1			
		$3x^2 - 6x = 9$	M1	ft for their y'		
		$x = 3$	A1	implies the M1		
		At P $y = 1$	B1			
		grad normal = –1/9 cao	B1			
		$y - 1 = -1/9\ (x - 3)$	M1	ft their (3, 1) and their grad, not 9		
		intercepts 12 and 4/3or use of $\int_0^{12} 4/3 - 1/9\ x\ dx$ (their normal)	B1	ft their normal (linear)		
		½ × 12 × 4/3 cao	A1		8	13
12	**i**	$\log_{10} P = \log_{10} a + \log_{10} 10^{bt}$	B1	condone omission of base		
		$\log_{10} 10^{bt} = bt$	B1			
		intercept indicated as $\log_{10} a$	B1		3	
	ii	3.9(0), 3.94, 4(.00), 4.05, 4.11	T1	to 3 sf or more; condone one error		
		plots ft	P1	1 mm		
		line of best fit ft	L1	ruled and reasonable	3	
	iii	(gradient =) 0.04 to 0.06 seen	M1			
		(intercept =) 3.83 to 3.86 seen	M1			
		(a =) 6760 to 7245 seen	A1			
		$P = 7000 \times 10^{0.05t}$ oe	A1	7000×1.12^t SC $P = 10^{0.05t + 3.85}$ left A2	4	
	iv	17 000 to 18 500	B2	14 000 to 22 000 B1	2	12