

**Mark Scheme 4752**  
**June 2006**

## Section A

1	1, 3	1,1		2	17
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	19
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	$\sqrt{x} = x^{1/2}$ soi $18x^2, \frac{1}{2} x^{-1/2}$ $36x$ $Ax^{-3/2}$ (from $Bx^{-1/2}$ )	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 <u>no</u> log wkg SC B1 r.o.t. 0.9537...	4	

## Section B

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