4752 (C2) Concepts for Advanced Mathematics

Section A

1	using Pythagoras to show that hyp. of right angled isos. triangle with sides *a* and *a* is $\sqrt{2}a$ completion using definition of cosine	M1 A1	www *a* any letter or a number NB answer given	2
2	$2x^6 + 5x$ value at 2 − value at 1 131	M2 M1 A1	M1 if one error ft attempt at integration only	4
3	(i) 193 (ii) divergent + difference between terms increasing o.e.	2 1	M1 for 8 + 15 + …+ 63	3
4	(i) 2.4 (ii) 138	2 2	M1 for 43.2 ÷ 18 M1 for their (i) × $\frac{180}{\pi}$ or $\theta = \frac{43.2 \times 360}{36\pi}$ o.e. or for other rot versions of 137.50…	4
5	(i)sketch of cos*x* ; one cycle, sketch of cos2*x*; two cycles, Both axes scaled correctly (ii) (1-way) stretch parallel to *y* axis sf 3	1 1 D1 1 D1		5
6	$y' = 3x^2 - 12x - 15$ use of $y' = 0$, s.o.i. ft $x = 5, -1$ c.a.o. $x < -1$ or $x > 5$ f.t.	M1 M1 A1 A1 A1	for two terms correct	5
7	use of $\cos^2\theta = 1 - \sin^2\theta$ at least one correct interim step in obtaining $4\sin^2\theta - \sin\theta = 0$. $\theta = 0$ and 180, 14.(47…) 165 - 166	M1 M1 B1 B1 B1	 NB answer given r.o.t to nearest degree or better -1 for extras in range	5

8	attempt to integrate $3\sqrt{x}$ − 5 [y=] $2x^{\frac{3}{2}} - 5x + c$ subst of (4, 6) in their integrated eqn c = 10 or [y=] $2x^{\frac{3}{2}} - 5x + 10$	M1 A2 M1 A1	 A1 for two terms correct	 5
9	(i) 7 (ii) 5.5 o.e.	1 2	 M1 for at least one of 5 $\log_{10}a$ or ½ $\log_{10}a$ or $\log_{10}a^{5.5}$ o.e.	 3

Section B

10	**i**	0.6(0..), 0.8(45..), [1], 1.1(76..) 1.3(0..), 1.6(0..) points plotted correctly f.t. ruled line of best fit	T 1 P1 L1	Correct to 2 d.p. Allow 0.6, 1.3 and 1.6 tol. 1 mm	 3
	ii	b = their intercept a = their gradient -11 ≤ b ≤ -8 *and* 21 ≤ a ≤ 23.5	M1 M1 A1		 3
	iii	34 to 35 m	1		1
	iv	29 = "22"logt – "9" t = $10^{\text{"}1.727..\text{"}}$ 55 [years] approx	M1 M1 A1	 accept 53 to 59	 3
	v	For small t the model predicts a negative height (or h = 0 at approx 2.75) Hence model is unsuitable	1 D1		2

11	**iA**	10+20+30+40+50+60	B1	or $\frac{6}{2}(2\times10+5\times10)$ or $\frac{6}{2}(10+60)$	1
	iB	correct use of AP formula with $a = 10$ and $d = 10$	M1		
		$n(5 + 5n)$ or $5n(n + 1)$ or $5(n^2 + n)$ or $(5n^2 + 5n)$	A1		
		$10n^2 + 10n - 20700 = 0$	M1	Or better	
		45 c.a.o.	A1		4
	iiA	4	1		1
	iiB	£2555	2	M1 for $5(1 + 2 + \ldots 2^8)$ or $5(2^9 - 1)$ o.e.	2
	iiC	correct use of GP formula with $a = 5$, $r = 2$	M1		
		$5(2^n - 1)$ o.e.= 2621435	DM1	"S" need not be simplified	
		$2^n = 524288$ www	M1		
		19 c.a.o.	A1		4
12	**i**	6.1	2	M1 for $\frac{(3.1^2-7)-(3^2-7)}{3.1-3}$ o.e.	2
	ii	$\frac{((3+h)^2-7)-(3^2-7)}{h}$	M1	s.o.i.	
		numerator $= 6h + h^2$	M1		
		$6 + h$	A1		3
	iii	as h tends to 0,	M1		
		grad. tends to 6 o.e. f.t.from "6"+h	A1		2
	iv	$y - 2 = $ "6" $(x - 3)$ o.e.	M1		
		$y = 6x - 16$	A1	6 may be obtained from $\frac{dy}{dx}$	2
	v	At P, $x = 16/6$ o.e. or ft	M1		
		At Q, $x = \sqrt{7}$	M1		
		0.021 cao	A1		3