Core 1 Integration Answers

8(a)	$y_D = 3+1 = 4$ or $y_C = 12-8 = 4$ Area $ABCD$ $= 3\times 4 = 12$	M1 A1	 2	Attempt at either y coordinate
(b)(i)	$x^3 - \frac{x^4}{4}$ $(+C)$	M1 A1 A1	 3	Increase one power by 1 One term correct unsimplified All correct unsimplified (condone no +C)
(ii)	Sub limits –1 and 2 into their (b) (i) ans $\left[8-4\right] - \left[-1-\frac{1}{4}\right]$ $= 5\frac{1}{4}$	M1 A1	 	May use both –1, 0 and 0, 2 instead
	Shaded area = "their" (rectangle– integral) $= 12 - 5\frac{1}{4} = 6\frac{3}{4}$	M1 A1	 4	Alt method: difference of two integrals **CSO**. Attempted M2, A2
(c)(i)	$\frac{dy}{dx} = 6x - 3x^2$	M1 A1	 2	One term correct All correct (no +C etc)
(ii)	When $x = 1$, $y = 2$ when $x = 1$, $\frac{dy}{dx} = 3$ as 'their' grad of tgt Tangent is $y - 2 = 3(x-1)$	B1 M1√ A1	 3	May be implied by correct tgt equation Ft their derivative when $x = 1$ Any correct form $y = 3x - 1$ etc
(iii)	Decreasing when $\frac{dy}{dx} = 6x - 3x^2 < 0$ $3(2x - x^2) < 0 \Rightarrow x^2 - 2x > 0$	M1 A1	 2	Watch no fudging here!! May work backwards in proof. **AG** (be convinced no step incorrect)
(d)	Two critical points 0 and 2 $x > 2$, $x < 0$ ONLY	M1 A1	 2	Marked on diagram or in solution or M1 A0 for $0 < x < 2$ or $0 > x > 2$ **SC** B1 for $x > 2$ (or $x < 0$)
	Total		**18**	

(b)(i)	$\frac{x^4}{4} - \frac{10x^3}{3} + 14x^2$ $(+c)$	M1 A1 A1	 3	One term correct unsimplified Another term correct unsimplified All correct unsimplified (condone missing + c)
(ii)	$\left[\frac{81}{4} - 90 + 126\right]$ (-0) $= 56\frac{1}{4}$	M1 A1	 2	Attempt to sub limit 3 into their (b)(i) AG Integration, limit sub'n all correct
(iii)	Area of triangle = $31\frac{1}{2}$ Shaded Area = $56\frac{1}{4}$ – *triangle area* $= 24\frac{3}{4}$	B1 M1 A1	 3	Correct unsimplified $\frac{1}{2}\times 21\times 3$ Or equivalent such as $\frac{99}{4}$

6(a)(i)	B (0,5) Area $AOB = \frac{1}{2}\times 1\times 5$ $= 2\frac{1}{2}$	B1 M1 A1	 3	 Condone slip in number or a minus sign
(ii)	$\frac{3x^6}{6}+\frac{2x^2}{2}+5x$ or $\frac{x^6}{2}+x^2+5x$ (may have + c or not)	M1 A1 A1	 3	Raise one power by 1 One term correct All correct unsimplified
(iii)	Area under curve = $\int_{-1}^{0} f(x)\,dx$	B1		Correctly written or F(0) – F(–1) correct
	$[0]-\left[\frac{1}{2}+1-5\right]$	M1		Attempt to sub limit(s) of –1 (and 0) Must have integrated
	Area under curve = $3\frac{1}{2}$	A1		**CSO** (no fudging)
	Area of shaded region = $3\frac{1}{2}-2\frac{1}{2}=1$	B1√	4	**FT** their integral and triangle (very generous)
(b)(i)	$\frac{dy}{dx}=15x^4+2$	M1 A1		One term correct All correct (no +c etc)
	when $x=-1$, gradient = 17	A1	3	**cso**
(ii)	$y =$ "their gradient"$(x+1)$	B1√	1	Must be finding **tangent** – not normal any form e.g. $y=17x+17$
	Total		**14**	

(b)(i)	$\int \ldots dx = \frac{x^4}{4}+2x^2-5x\ (+c)$	M1 A1 A1	 3	one term correct unsimplified second term correct unsimplified all correct unsimplified
(ii)	$\left[4+8-10\right]-\left[\frac{1}{4}+2-5\right]$	M1		correct use of limits 1 and 2; F(2) – F(1) attempted
	$=4\frac{3}{4}$	A1		
	Area of $\Delta = \frac{1}{2}\times 11 = 5\frac{1}{2}$	B1		correct unsimplified
	$\Rightarrow$ shaded area $= 5\frac{1}{2}-4\frac{3}{4}$			combined integral of $7x-6-x^3$ scores M1 for limits correctly used then
	$=\frac{3}{4}$	A1	4	A3 correct answer with all working correct

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