

Q	Marking instructions	AO	Mark	Typical solution
14(a)	Uses $y = 0$ to obtain a non-zero value of $t$	3.1a	M1	$y = 0 \Rightarrow 4t^2 - t^3 = 0$ $t = 0 \text{ or } 4$ $\frac{dy}{dt} = 8t - 3t^2$ $\frac{dx}{dt} = 2t + 1$ $t = 4 \Rightarrow \frac{dy}{dx} = -\frac{16}{9}$
	Obtains $\frac{dy}{dt} = 8t - 3t^2$ or $\frac{dy}{dt} = -16$	1.1b	B1	
	Obtains $\frac{dx}{dt} = 2t + 1$ or $\frac{dx}{dt} = 9$	1.1b	B1	
	Uses their $\frac{dy}{dt} \div$ their $\frac{dx}{dt} = \frac{dy}{dx}$ and their non-zero value of $t$ to find a numerical expression or value for $\frac{dy}{dx}$	3.1a	M1	
	Obtains $-\frac{16}{9}$ OE	1.1b	A1	
	<b>Subtotal</b>		<b>5</b>	

Q	Marking instructions	AO	Mark	Typical solution
14(b)(i)	Deduces $b = 20$ (FT $t^2 + t$ for their value of $t$ )	2.2a	B1F	$b = 20$
	<b>Subtotal</b>		<b>1</b>	

Q	Marking instructions	AO	Mark	Typical solution
14(b)(ii)	Substitutes their $dx = (2t + 1)dt$	3.1a	M1	$\frac{dx}{dt} = 2t + 1 \Rightarrow dx = (2t + 1)dt$ $A = \int_0^{20} y dx$ $= \int_0^4 (4t^2 - t^3)(2t + 1) dt$ $= \int_0^4 8t^3 + 4t^2 - 2t^4 - t^3 dt$ $= \int_0^4 4t^2 + 7t^3 - 2t^4 dt$
	Completes correct substitution for $y$ and $dx$ Condone incorrect or omission of limits.	1.1b	A1F	
	Completes rigorous argument, to show given result. $t = 4$ when $x = 20$ must be justified either here or in part (b)(i)	2.1	R1	
	<b>Subtotal</b>		<b>3</b>	

Q	Marking instructions	AO	Mark	Typical solution
14(b)(iii)	Evaluates $A = 1856/15$ or AWRT 124	1.1b	B1	$A = \frac{1856}{15}$
	<b>Subtotal</b>		<b>1</b>	

	<b>Question Total</b>		<b>10</b>	
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