

Integration 1 Answers

1)	<p>(i) $2(1+x)^{\frac{1}{2}}(+c)$</p>	M1, A1 [2]	M1 for $(1+x)^{\frac{1}{2}}$, A1 for 2
	<p>(ii) $\frac{dy}{dx} = \frac{2\sqrt{1+x} - 2x \frac{1}{2}(1+x)^{-\frac{1}{2}}}{1+x}$ $= \frac{2}{(\sqrt{1+x})} - \frac{x}{(\sqrt{1+x})^3}$</p>	M1 A2, 1, 0 A1 [4]	M1 attempt at differentiation -1 each error A1 all correct
	<p>(iii) $\int \frac{x}{(\sqrt{1+x})^3} dx = \int \frac{2}{(\sqrt{1+x})} dx - \frac{2x}{\sqrt{1+x}}$ $= 4\sqrt{1+x} - \frac{2x}{\sqrt{1+x}} (+c)$ $\int_0^3 \frac{x}{(\sqrt{1+x})^3} dx = (8-3) - (4), = 1$</p>	M1 A1 M1, A1 [4]	M1 for idea of using (ii) 'in reverse' A1 all correct M1 for attempt evaluation
2)	<p>(a) $\int x^{\frac{2}{3}} - 6x^{\frac{1}{3}} + 9 dx = \frac{3}{5}x^{\frac{5}{3}} - \frac{9}{2}x^{\frac{4}{3}} + 9x(+c)$</p>	M1 A2,1,0 [3]	M1 for expansion and attempt to integrate -1 each error
	<p>(b) (i) $\frac{dy}{dx} = \sqrt{x^2+6} + x \left(\frac{2x}{2\sqrt{x^2+6}} \right)$</p>	M1 A2,1,0 [3]	M1 for attempt to differentiate a product. -1 each error
	<p>(ii) $\int \frac{x^2+3}{\sqrt{x^2+6}} dx = \frac{1}{2}x\sqrt{x^2+6}$</p>	M1 A1 [2]	M1 for use of their answer to (i)
3)	<p>(i) Uses product rule $\sqrt{4x+12} + \frac{1}{2} \times 4x(4x+12)^{\frac{1}{2}}$ Expresses with common denominator $k = 6$</p>	M1 A1 M1 A1	
	<p>(ii) $\frac{3}{k}x\sqrt{4x+12}$ Uses limits 20</p>	M1 A1	
4)	<p>(i) $\frac{d}{dx}(\ln x) = \frac{1}{x}$ $1 + \ln x$</p>	7 B1 B1	
	<p>(ii) $\int (1 + \ln x) dx = x \ln x (+c)$ $\int \ln x dx = x \ln x - \int 1 dx (+c)$ $x \ln x - x (+c)$</p>	M1 M1 A1	

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5)

$$\int_0^{\pi/6} \cos(2x + \pi/6) dx = \left[\sin(2x + \pi/6) \right]_0^{\pi/6} = \sin(\pi/2) - \sin(\pi/6) = 1 - 0.5 = 0.5$$

6)

$$2x + \frac{5x^2}{2} + \frac{1}{x-2} (+c) \text{ oe}$$

B1 + B1 + B1 [3]

7)

<p>(i) $3xe^{3x} + e^{3x} - e^{3x}$ $= 3xe^{3x}$</p>	<p>M1, A1, B1 [3]</p>	<p>M1 for attempt to differentiate a product. A1 for correct product. B1 for $-e^{3x}$</p>
<p>(ii) $\int xe^{3x} dx = \frac{1}{3} \left(xe^{3x} - \frac{e^{3x}}{3} \right)$</p>	<p>DM1 DM1 A1 [3]</p>	<p>DM1 for recognition of the 'reverse' to (i) DM1 for dealing with '3' A1 all correct (condone omission of c)</p>

8)

(a) (i) $k(2x - 1)^{-3} + (c)$ M1
 $k = -2$ A1

(ii) multiplies out and integrates M1
 $\frac{x^4}{4} - \frac{2x^3}{3} + \frac{x^2}{2} (+c)$ A2, 1, 0

(b) (i) uses product rule M1
 $2\sqrt{x+4} + \frac{(x-5)}{\sqrt{x+4}} \text{ oe}$ A1
 correct completion A1

(ii) $k(x-5)\sqrt{x+4}$ M1
 $k = \frac{2}{3} \text{ oe}$ A1

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