Grading schemeMT1-106

Q1)

a) $F'(x) = 3x^2\sqrt{1+x^{12}} - 2\sqrt{1+16x^4}$. **(1) + (1)**

b) $\int \frac{dx}{x^{\frac{1}{3}}(2+3x^{\frac{2}{3}})^4} = \frac{1}{2}\int \frac{du}{u^4} = \frac{-1}{6\left(2+3x^{\frac{2}{3}}\right)^3} + C$ **(2) + (1)**

c) $\int_{\mathbf{0}}^{\mathbf{2}} \sqrt{1+4x}\,dx = \frac{1}{6}\left[\left(1+4x\right)^{\frac{3}{2}}\right]_0^2 = \frac{13}{3} = 2\sqrt{1+4c}$

(2)

So $c = \frac{133}{144}$ **(1)**

Q2) a) $\int \frac{(2+e^{4x})}{8x+e^{4x}}dx = \frac{1}{4}\int \frac{du}{u} = \frac{1}{4}\ln|8x+e^{4x}| + C$

(2)+(1)

b) $y = \frac{(3x+1)^5(x^3+1)^{1/3}}{(1+x^2)^4 e^x}$

$lny = 5\ln(3x+1) + \frac{1}{3}\ln(x^3+1) - 4\ln(1+x^2) - x$

(1)

So y'=$(\frac{15}{3x+1} + \frac{x^2}{x^3+1} - \frac{8x}{1+x^2} - 1)y$ **(1)**

d) $\int \frac{e^x \sin^{-1}(e^x)}{\sqrt{1-e^{2x}}} dx = \int u du = \frac{1}{2}(\sin^{-1} e^x)^2 + C$

(2) +(1)

Q3) a) $\int \frac{dx}{x\sqrt{x^8-16}} = \frac{1}{4}\int \frac{du}{u\sqrt{u^2-16}} = \frac{1}{16}\sec^{-1}\left(\frac{x^4}{4}\right) + C$

(2) + (1)

b) $\int \frac{x^2 dx}{\sqrt{4+x^6}} = \frac{1}{3}\int \frac{du}{\sqrt{4+u^2}} = \frac{1}{3}\sinh^{-1}\left(\frac{x^3}{2}\right) + C$

(2) +(1)

c) $\int \frac{tanx}{\sqrt{9-(cosx)^2}} dx = -\int \frac{du}{u\sqrt{9-u^2}} = \frac{1}{3}\text{sech}^{-1}(\frac{|cosx|}{3}) + C$

(2) + (1)