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MAT 104 ASSIGNMENT

1. $y = \dfrac{[(x+1)^2(x-2)^{1/2}]}{[(2x-1)(x-3)^{4/3}]}$

$\ln y = [\ln[x+1)^2 + \ln(x-2)^{1/2}] - [\ln(2x-1) + \ln(x-3)^{4/3}]$

$\frac{1}{y}\cdot\frac{dy}{dx} = \frac{1}{(x+1)^2}\cdot 2(x+1) + \frac{1}{(x-2)^{1/2}}\cdot\frac{(x-2)^{-1/2}}{2} - \left[\frac{1}{2x-1}\cdot 2 + \frac{1}{(x-3)^{4/3}}\cdot\frac{4(x-3)^{1/3}}{3}\right]$

$\frac{1}{y}\cdot\frac{dy}{dx} = \left[\frac{2(x+1)}{(x+1)^2} + \frac{(x-2)^{-1/2}}{2(x-2)^{1/2}}\right] - \left[\frac{2}{2x-1} + \frac{4(x-3)^{1/3}}{3(x-3)^{4/3}}\right]$

$\frac{1}{y}\cdot\frac{dy}{dx} = \left[\frac{2}{x+1} + \frac{3}{(x-2)^{1/2}} - \frac{2}{2x-1} - \frac{4}{3(x-3)}\right]$

$\frac{dy}{dx} = y\left[\frac{2}{x-1} + \frac{3}{(x-2)^{1/2}} - \frac{2}{2x-1} - \frac{4}{3(x-3)^{1/4}}\right]$

$\frac{dy}{dx} = \frac{(x+1)^2(x-2)^{1/2}}{(2x-1)(x-3)^{4/3}}\left[\frac{2}{x-1} + \frac{3}{(x-2)^{1/2}} - \frac{2}{2x-1} - \frac{4}{3(x-3)^{1/4}}\right]$

2. $y = \dfrac{[3e^k \sin 2k]}{k^{5/2}}$

$\ln y = \ln 3e^k + \ln \sin 2k - \ln k^{5/2}$

$\frac{1}{y}\cdot\frac{dy}{dx} = \frac{1}{3e^k}\cdot 3e^k + \frac{1}{\sin 2k}\cdot\cos 2k\cdot 1 - \frac{5}{2}k^{3/2}$

$\frac{1}{y}\cdot\frac{dy}{dx} = \frac{3e^k}{3e^k} + \frac{\cos 2k}{\sin 2k} - \frac{5/2\,k^{3/2}}{k^{5/2}}$

$\frac{1}{y}\cdot\frac{dy}{dx} = 1 + \cot 2k - \frac{5/2\,k^{3/2}}{k^{5/2}}$

$\frac{dy}{dx} = y\left[1 + \cot 2k - \frac{5/2\,k^{3/2}}{k^{5/2}}\right]$

$\frac{dy}{dx} = \frac{3e^k \sin 2k}{k^{5/2}}\left[1 + \cot 2k - \frac{5/2\,k^{3/2}}{k^{5/2}}\right]$

Integrate

1. $\int 4\sec^2(3m+1)\, dm$

$u = 3m+1$

$du = 3\,dm$

$dm = \frac{du}{3}$

$\int 4\sec^2 u \cdot \frac{du}{3}$

$4/3 \int \sec^2 u\, du$

$4/3 \tan u + c$

$= 4/3 \tan(3m+1) + c$

2. $\int 2t \times (3t^2-1)^{1/2}$

$u = 3t^2 - 1$

$\frac{du}{dt} = 6t$

$dt = \frac{du}{6t}$

$\int 2t \times (u)^{1/2} \frac{du}{6t}$

$\int 1/3 \times u^{1/2} du$

$1/3 \int u^{1/2} du$

$= \frac{1}{3} \times \frac{u^{1/2+1}}{1/2+1} + c$

$= 1/3 \times 2/3 u^{3/2} + c$

$= 2/9 u^{3/2} + c$

$= \frac{2}{9}(3t^2-1)^{3/2} + c$

3. $\int \frac{2}{(4x^2$

u

du

d

$= \int 2$

$= \frac{1}{4}$

$=$

$=$

$=$

$=$

3. $\int \frac{2x}{(4x^2-1)^{1/2}} = \int 2x(4x^2-1)^{-1/2}\,dx$

$u = 4x^2 - 1$

$du = 8x\,dx$

$dx = \frac{du}{8x}$

$= \int \cancel{2x}^{1}(u)^{-1/2}\,\frac{du}{\cancel{8x}\,4}$

$= \frac{1}{4}\int u^{-1/2}\,du$

$= \frac{1}{4} \times \frac{u^{-1/2+1}}{-1/2+1}$

$= \frac{1}{4} \times \frac{u^{1/2}}{1/2}$

$= 1/4 \times 2u^{1/2}$

$= 1/2\,u^{1/2}$

$= \frac{1}{2}(4x^2-1)^{1/2}$