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MATRIC NO: 19/Eng02/011

COURSE: MAT 104

ASSIGNMENT

1) Differentiate the following

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

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

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

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

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

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

2) $y = \frac{[3e^x \sin 2x]}{x^{5/2}}$

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

$\frac{1}{y}\cdot\frac{dy}{dx} = \left[\frac{1}{3e^x}\cdot 3e^x + \frac{1}{\sin 2x}\cdot 2\cos 2x\right] - \left[\frac{1}{x^{\frac{5}{2}}}\cdot\frac{5x^{\frac{3}{2}}}{2}\right]$

$\frac{1}{y}\cdot\frac{dy}{dx} = \left[1 + \frac{2\cos 2x}{\sin 2x}\right] - \left[\frac{5}{2x}\right]$

$\frac{dy}{dx} = y\left[1 + \frac{2\cos 2x}{\sin 2x}\right] - \left[\frac{5}{2x}\right]$

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

Integrate the following with respect to the variable:

3.) $\frac{2x}{(4x^2-1)^{\frac{1}{2}}}$

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

$u = 4x^2 - 1$

$\cancel{du = 8x}\ du = 8x\,dx$

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

$= \int 2x(u)^{-\frac{1}{2}} \cdot \frac{du}{8x}$

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

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

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

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

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

1) $4\sec^2(3m+1)$

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

Let $u = 3m+1$

$du = 3dm$

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

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

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

$= \frac{4}{3}\tan u + c$

$= \frac{4}{3}\tan(3m+1) + c$

2.) $2t(3t^2-1)^{\frac{1}{2}}$

$\int 2t(3t^2-1)^{\frac{1}{2}}dt$

Let $u = 3t^2-1$

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

$du = 6t\,dt$

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

$= \int 2t \cdot u^{\frac{1}{2}} \cdot \frac{du}{6t}$

$= \frac{1}{3}\int u^{\frac{1}{2}}du$

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

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

$= \frac{2}{9}u^{\frac{3}{2}} + c$

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