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ELECT/ELECT ENGINEERING
19/ENG04/055
MAT 104 ASSIGNMENT

1 $y = \frac{((x+1)^2(x-2)^{1/2})}{((2x-1)(x-3)^{4/3})} = \frac{u}{v}$

~~PRODUCT RULE~~ NOMINATOR

$f = (x+1)^2 \quad h = (x-2)^{1/2}$

$\frac{df}{dx} = \frac{df}{dt} \times \frac{dt}{dx}, \quad x+1 = t$

$\frac{df}{dx} = 2t \times 1 = 2t = 2x+2$

$\frac{dh}{dx} = \frac{dh}{dz} \times \frac{dz}{dx}, \quad x-2 = z$

$\frac{dh}{dx} = 2z^{-1/2} \times 1 = 2z^{-1/2} = 2(x-2)^{-1/2}$

$\frac{dy}{dx} = \frac{v\,du/dx - u\,dv/dx}{v^2}$

$\frac{du}{dx} = \frac{dfh}{dx} = ((x+1)^2 \cdot 2(x-2)^{-1/2}.) + ((x-2)^{1/2} 2(2x+2))$

DENOMINATOR

$m = (2x-1) \quad n = (x-3)^{4/3}$

$\frac{dm}{dx} = 2$

$\frac{dn}{dx} = \frac{dn}{dk} \times \frac{dk}{dx}, \quad x-3 = k$

$\frac{dn}{dx} = \frac{4k^{1/3}}{3} \times 1 = \frac{4k^{1/3}}{3} = \frac{4(x-3)^{1/3}}{3}$

$$\frac{dv}{dx} = \frac{dnn}{dx} = (6x-1)\left(\frac{4}{3}(x-3)^{1/3}\right) + 2(x-3)^{4/3}$$

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

$$((2x-1)(x-3)^{4/3})^2$$

2 $y = \frac{3e^k \sin 2k}{k^{5/2}}$

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

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

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

$\frac{1}{y} \cdot dy/dk = 1 + 2\cot 2k - 5x^{-1}/2$

$dy/dk = \frac{3e^k \sin 2k}{k^{5/2}}(1 + 2\cot 2k - 5x^{-1}/2)$

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

let $u = 3m + 1$

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

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

$= \frac{4}{3} \times \tan m + C = \frac{4\tan m}{3} + C$

4 $\int 2t(3t^2-1)^{1/2}\,dt$

Let $u = 3t^2 - 1$

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

$= \frac{2}{6}\int (u)^{1/2}\,du$

$= \frac{2}{6} \times \frac{2}{3} \times u^{3/2} + C$

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

5 $\int \frac{2x}{(4x^2-1)^{1/2}}\,dx = \int 2x(4x^2-1)^{-1/2}\,dx$

Let $u = 4x^2 - 1$

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

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

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