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19/ENG06/031

MECHANICAL ENGINEERING

MAT 104

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

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

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

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

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

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

$$\int \frac{dy}{y} = \ln |y| = \ln \left| 1 + \frac{2 \cos 2x}{\sin 2x} - \frac{5}{2} k^{-1} \right|$$

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

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

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

$$\int \frac{dy}{y} = \int \frac{2 \cos 2x}{\sin 2x} dx$$

$$\text{let } u = \sin 2x$$

$$\frac{du}{dx} = 2 \cos 2x$$

$$du = 2 \cos 2x dx$$

$$\frac{du}{2} = \frac{du}{2} \quad \int \frac{du}{u} = \frac{du}{2}$$

$$\frac{1}{2} \ln |u| + C$$

$$\text{But } u = \sin 2x$$

$$\frac{1}{2} \ln |\sin 2x| + C$$

$$\int \frac{dx}{\sqrt{3x^2 - 1}}$$

$$\text{let } u = \sqrt{3x^2 - 1}$$

$$u^2 = 3x^2 - 1$$

$$3x^2 = u^2 + 1$$

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

$$x = \frac{\sqrt{u^2 + 1}}{\sqrt{3}}$$

$$x = \frac{\sqrt{u^2 + 1}}{\sqrt{3}}$$

$$\frac{dx}{du} = \frac{2u}{6} \left[\frac{u^2 + 1}{3} \right]^{-1/2}$$