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Electrical Electronics Engg.

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MAT 104

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

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

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

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

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

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

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

$$2. \text{ If } y = \frac{3e^{2x} \sin 2x}{x^{5/2}}$$

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

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

$$\frac{1}{y} \frac{dy}{dx} = \frac{1}{3e^{2x}} (3e^{2x}) + \frac{1}{\sin 2x} (\cos 2x) - \frac{5}{4} \frac{1}{x^{3/2}}$$

$$\frac{1}{y} \frac{dy}{dx} = \frac{3e^{2x}}{3e^{2x}} + \frac{\cos 2x}{\sin 2x} - \frac{5/4 x^{3/2}}{x^{3/2}}$$

$$\frac{1}{y} \frac{dy}{dx} = \left[\frac{3e^{2x}}{3e^{2x}} + \frac{\cos 2x}{\sin 2x} - \frac{5/4 x^{3/2}}{x^{3/2}} \right]$$

$$\frac{dy}{dx} = y \left[1 + \frac{\cos 2x}{\sin 2x} - \frac{5/4 x^{3/2}}{x^{3/2}} \right]$$

$$\frac{dy}{dx} = \frac{3e^{2x} \sin 2x}{x^{5/2}} \left[1 + \frac{\cos 2x}{\sin 2x} - \frac{5/4 x^{3/2}}{x^{3/2}} \right]$$

Integration

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

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

$$u = 3m+1$$

$$du = 3 dm$$

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

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

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

$$\frac{4}{3} \tan u + C$$

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

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

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

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

$$\frac{du}{dt} = \frac{6t}{dt} \cdot 1t$$

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

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

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

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

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

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

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

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

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

$$u = 4x^2-1$$

$$du = 8x dx$$

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

$$\int 2x (u)^{-3/2} \frac{du}{8x}$$

$$\frac{1}{4} \int u^{-3/2} du$$

$$= \frac{1}{4} \times \frac{u^{-3/2+1}}{-3/2+1}$$

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

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

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