

$$26) \int 2t \times (3t^2 - 1)^{1/2} dt$$

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

$$\frac{du}{dt} = \frac{d(3t^2 - 1)}{dt}$$

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

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

$$6+3$$

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

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

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

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

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

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

27)

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

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

$$du = 8x dx$$

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

$$\frac{dy}{dx} = 1$$

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

Multiply both sides by y

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

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

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

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

$$u = 3m+1$$

$$du = 3 dm$$

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

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

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

Integration of  $\sec^2 u$   
 $= \tan u + C$

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

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

1b)  $y = \frac{3e^x \sin 2x}{x^{5/2}}$

- find the log of both sides

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

Differentiate with respect to

$$\frac{d}{dx} (\ln y) = \frac{d}{dx} (3e^x) + \frac{d}{dx} (\ln \sin 2x)$$

$$- \frac{d}{dx} (\ln x^{5/2})$$