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

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

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

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

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

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

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

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

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

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

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

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

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

Find the log of both sides

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

Differentiate wrt to x

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

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

$u = 3m+1$

$du = 3dm$

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

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

$4/3 \int \sec^2 u\, du$

$= \tan u + c$

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

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

$u^{1/2} - 1/2$

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

$u = 3t^2 - 1$

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

$dt = \frac{du}{}$

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

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

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

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

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

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

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

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

$u = 4x^2 - 1$

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

$\frac{1}{8} dx = \frac{du}{8x}$

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

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

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

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

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