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### Assignment

#### Section A

Differentiate the following

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

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

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

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

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

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

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

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

find the log of both sides

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

Differentiating with respect to x

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

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

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



multiply both sides

$$\frac{1}{y} \frac{dy}{dx} \times y = y \left[ \frac{30^{2x}}{30^{2x}} + \frac{\cos 2x}{\sin 2x} - \frac{5/2 x^{3/2}}{x^{5/2}} \right]$$

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

$$\frac{dy}{dx} = \frac{30^{2x} \sin 2x}{x^{5/2}} \left( \frac{1 + \cos 2x}{\sin 2x} - \frac{5/2 x^{3/2}}{x^{5/2}} \right)$$

### SECTION B

Integrate the following with respect to the variable

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

$$u = 3m + 1$$

$$du = 3 dm$$

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

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

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

Integrate  $\sec^2 u$

$$= \tan u + C$$

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

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

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

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

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

$$\left. \begin{array}{l} \frac{5/2 x^{3/2}}{x^{5/2}} \\ x^{3/2} \\ -1/2 x^{1/2} \\ x^{1/2} \end{array} \right\}$$

to the variable

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

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

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

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

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

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

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

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

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

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

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

$$du = 8x dx$$

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

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

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

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



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

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

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

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