

ISAAC ENE GRACE

19/ENG08/004

BIOMEDICAL ENGINEERING.

① $\frac{d}{dx} (2x^2 + 3) \ln(2x)$

$$\frac{d}{dx} \left[(2x^2 + 3) \ln(2x) - (2x^2 + 3) \cdot \frac{d}{dx} [\ln(2x)] \right]$$

$$\ln^2(2x)$$

$$(2 \cdot \frac{d}{dx} [x^2] + \frac{d}{dx} [3]) \ln(2x) - (2x^2 + 3) \cdot \frac{1}{2x} \cdot \frac{d}{dx} [2x]$$

$$\ln^2(2x)$$

$$(2 \cdot \frac{d}{dx} [x^2] + \frac{d}{dx} [3]) \ln(2x) - (2x^2 + 3) \cdot \frac{1}{2x} \cdot \frac{d}{dx} [2x]$$

$$\ln^2(2x)$$

$$(2 \cdot 2x + 0) \ln(2x) - (2x^2 + 3) \cdot \frac{2 \cdot \frac{d}{dx} [2x]}{2x}$$

$$\ln^2(2x)$$

$$= 4x \ln(2x) - (2x^2 + 3) \cdot 1$$

$$\ln^2(2x)$$

$$= 4x \ln(2x) - (2x^2 + 3) \cdot 1$$

$$\ln^2(2x)$$

$$= 4x - 2x^2 + 3$$

at $x = 2.5$

$$\frac{4(2.5)}{\ln(2(2.5))} - 2(2.5)^2 + 3$$

$$= 3.8198 \approx 3.82 \text{ to } 3.0\%$$

② $\frac{d}{dx} \left[\frac{2x}{x^2 - 5} \right]$

$$= 2 \cdot \frac{d}{dx} \left[\frac{x}{x^2 - 5} \right]$$

$$= 2 \cdot \frac{\frac{d}{dx} [x] \cdot (x^2 - 5) - x \cdot \frac{d}{dx} [x^2 - 5]}{(x^2 - 5)^2}$$

$$= 2 \left(\frac{1(x^2 - 5) - (x \cdot (2x))}{(x^2 - 5)^2} \right)$$

$$= 2 \left(\frac{1(x^2 - 5) - (2x^2)}{(x^2 - 5)^2} \right)$$

$$2(x^2 - (2x + 0)x - 5)$$

$$\frac{(x^2 - 5)^2}{(x^2 - 5)^2}$$
$$= 2(-x^2 - 5)$$
$$\frac{(x^2 - 5)^2}{(x^2 - 5)^2}$$

$$m = \frac{-2(2)^2 - 10}{[(2)^2 - 5]^2}$$
$$= -18$$

$$\text{Gradient} = -18$$

$$\textcircled{3} \quad Z = 2x^3 \ln y$$

$$u = 2x^3 \quad u = \ln y$$

$$\frac{du}{dx} = 6x^2 \frac{dx}{dx} \quad \frac{du}{dy} = \frac{1}{y}$$

$$\frac{dz}{dy} = 2x^3 \cdot \frac{1}{y} + \ln y \cdot 6x^2 \frac{dx}{dy}$$

$$\frac{dz}{dy} = \frac{2x^3}{y} + 6x^2 \ln y \frac{dx}{dy}$$

$$\textcircled{4} \quad \int_0^2 x(2x^2 + 1)^{1/2} dx$$

$$\text{let } u = 2x^2 + 1$$

$$\frac{du}{dx} = 4x$$

$$du = dx \cdot 4x$$

$$dx = \frac{du}{4x}$$

$$\int_0^2 \frac{u^{1/2} \cdot du}{4}$$

$$\frac{1}{4} \int_0^2 u^{1/2} du$$

$$\frac{1}{4} \left[\frac{u^{3/2}}{3/2} \right]_0^2$$

$$= \frac{1}{6} \left[(2(2)^2 + 1)^{3/2} - (2(0) + 1)^{3/2} \right]$$

$$= \frac{1}{6} [27 - 1]$$

$$\frac{1}{6} [26]$$

$$= 4.333 = 4.33$$