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UK 1

1) Dengan Menggunakan Metode Substitusi, hitung hasil Integral berikut.

$$\int_1^e \frac{4 \ln u}{u} \, du$$

2) Misalkan

$$f(u) = \frac{(u-1)^3 \cdot (u+1)^5}{\sqrt{2u+1}}$$

Dengan Menggunakan turunan logaritmik, tentukan $f'(0)$.

Jawab

1. $\int_1^e \frac{4 \ln u}{u} \, du$

Substitusi: $t = \ln u$

$t' = \frac{1}{u}$

$du = \frac{dt}{t'} \Leftrightarrow du = \frac{dt}{\frac{1}{u}} \Leftrightarrow \frac{1}{u} du = dt$

$$\int_1^e \frac{4 \ln u}{u} \, du = \int_1^e 4t \, dt$$

$$= \left[\frac{4t^{1+1}}{1+1} \right]_1^e$$

$$= \left[2t^2 \right]_1^e$$

$$= \left[2 \ln^2 u \right]_1^e$$

$$= 2 \ln^2 e - 2 \ln^2 1$$

2. $f(x) = \dfrac{(x-1)^3 (x+1)^5}{\sqrt{2x+1}}$

(i) $\ln f(x) = \ln \dfrac{(x-1)^3 (x+1)^5}{\sqrt{2x+1}}$

(ii) $\ln f(x) = 3 \ln (x-1) + 5 \ln (x+1) - \frac{1}{2} \ln (2x+1)$

Turunan Implisit

$\ln f(x) - 3 \ln (x-1) - 5 \ln (x+1) + \frac{1}{2} \ln (2x+1) = 0$

$$\frac{d}{dx} = \frac{d}{dx} \left(\ln f(x) - 3 \ln (x-1) - 5 \ln (x+1) + \frac{1}{2} \ln (2x+1) \right)$$

$$= 0 - 3 \frac{1}{x-1} - 5 \frac{1}{x+1} + \frac{1}{2} \frac{1}{2x+1} = -\frac{3}{x-1} - \frac{5}{x+1} + \frac{1}{4x+2}$$

$$= \frac{-15x^2 - 9x + 1}{2x^3 + x^2 - 2x - 1}$$

$$\frac{d}{df(x)} = \frac{d}{df(x)} \left(\ln f(x) - 3 \ln (x-1) - 5 \ln (x+1) + \frac{1}{2} \ln (2x+1) \right) = \frac{1}{f(x)}$$

$$\frac{d f(x)}{dx} = \frac{\frac{d}{dx}}{\frac{d}{df(x)}} = \frac{\frac{-15x^2 - 9x + 1}{2x^3 + x^2 - 2x - 1}}{\frac{1}{f(x)}}$$

$$f'(x) = \frac{(-15x^2 - 9x + 1) f(x)}{2x^3 + x^2 - x - 1}$$

$$f'(0) = \frac{(-15 . 0^2 - 9 . 0 + 1) . (-1)}{2 . 0^3 + 0^2 - 2 . 0 \ 3 - 1}$$

$$= \frac{(-1)}{-1}$$

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