

Pertemuan 14

Integral Tentu Lanjutan

* Substitusi

Contoh :

$$\textcircled{1} \int_0^2 20 (2x-2)^9 dx = \dots$$

Jawab

$$\int_0^2 20 (2x-2)^9 dx = \dots$$

$$\text{misal : } u = 2x - 2$$

$$u' = \frac{du}{dx} = 2$$

$$du = 2 dx$$

$$dx = \frac{1}{2} du = \frac{du}{2}$$

Sehingga :

$$\int_0^2 20 (2x-2)^9 dx = \int_0^2 20 \cdot u^9 \cdot \frac{1}{2} du$$

$$= 10 \cdot \frac{1}{10} u^{10} \Big|_0^2$$

$$= (2x-2)^{10} \Big|_0^2$$

$$= (2 \cdot 2 - 2)^{10} - (2 \cdot 0 - 2)^{10}$$

$$= 2^{10} - (-2)^{10}$$

$$= 1024 - 1024$$

$$= 0$$

$$* \int_{-1}^1 \sqrt{3x+4} \, dx$$

jawab :

misal : $u = 3x + 4$

$$u' = \frac{du}{dx} = 3$$

$$dx = \frac{1}{3} du = \frac{du}{3}$$

sehingga :

$$\int_{-1}^1 \sqrt{3x+4} \, dx = \int_{-1}^1 (3x+4)^{1/2} \, dx$$

$$= \int_{-1}^1 u^{1/2} \frac{du}{3}$$

$$= \frac{1}{\frac{1}{2}+1} \cdot \frac{1}{3} u^{\frac{1}{2}+1} \Big|_{-1}^1$$

$$= \frac{2}{3} \cdot \frac{1}{3} u^{3/2} \Big|_{-1}^1$$

$$= \frac{2}{9} (3x+4)^{3/2} \Big|_{-1}^1$$

$$= \frac{2}{9} \sqrt{(3x+4)^3} \Big|_{-1}^1$$

$$= \left\{ \frac{2}{9} \sqrt{(3 \cdot 1 + 4)^3} - \frac{2}{9} \sqrt{(3 \cdot (-1) + 4)^3} \right\}$$

$$= \frac{2}{9} \sqrt{7^3} - \frac{2}{9} \sqrt{1^3}$$

$$= \frac{2}{9} \cdot \sqrt{343} - \frac{2}{9} \cdot 1 = \frac{2\sqrt{343} - 2}{9}$$