

$$\int_1^{10} x^2 \exp(-x) dx$$

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1) Metode Eksak

$$I = \int_1^{10} x^2 \exp(-x) dx$$

$$I = \int_1^{10} x^2 e^{-x} dx$$

$$= \int x^2 e^{-x} dx$$

$$= x^2 (-e^{-x}) - \int -e^{-x} \cdot 2x dx$$

$$= x^2 (-e^{-x}) - 1 \cdot (-2) \cdot \int e^{-x} x dx$$

$$= x^2 (-e^{-x}) + 2x \int x e^{-x} dx$$

$$= x^2 (-e^{-x}) + 2(x (-e^{-x}) - \int -e^{-x} dx)$$

$$\Rightarrow \text{Gunakan sifat integral } \int -f(x) dx = -\int f(x) dx$$

$$= x^2 (-e^{-x}) + 2(x (-e^{-x}) + \int e^{-x} dx)$$

$$\Rightarrow \text{Gunakan } \int e^{-x} dx = -e^{-x}$$

$$= x^2 (-e^{-x}) + 2(x (-e^{-x}) - e^{-x})$$

$$\Rightarrow \text{Sederhanakan}$$

$$= -x^2 e^{-x} - 2x e^{-x} - 2e^{-x}$$

$$\Rightarrow \text{Kembali ke Limit dari Integral } \int_1^{10}$$

$$= (-x^2 e^{-x} - 2x e^{-x} - 2e^{-x}) \Big|_1^{10}$$

$$\Rightarrow \text{Menggunakan } F(x) \Big|_a^b = F(b) - F(a)$$

$$= -10^2 e^{-10} - 2 \cdot 10 e^{-10} - 2e^{-10} - (-1^2 e^{-1} - 2 \cdot 1 e^{-1} - 2e^{-1})$$

$$\Rightarrow \text{Sederhanakan}$$

$$= -\frac{122}{e^{10}} + \frac{5}{e} \approx 1.83386$$

$$I \approx 1.83386$$