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18/ENG04/057

Electrical Engineering

1) $y = 3e^{2x}$

$y = 3e^{-x}$

$$A = \int_{x_1}^{x_2} f(x) - g(x) dx$$

$$= \int_1^2 3e^{2x} - 3e^{-x} dx$$

$$= 3 \int_1^2 e^{2x} - e^{-x} dx$$

$$= 3 \int_1^2 \frac{e^{2x}}{2} - e^{-x}$$

$$= 3 \left(\frac{e^{2(2)}}{2} + e^{(-2)} \right) - 3 \left(\frac{e^{2(1)}}{2} + e^{(-1)} \right)$$

$$= 3 \times 27.4344103 - 3 \times 4.0624$$

$$= 82.30 - 12.18$$

$$= 70.12 \text{ square unit}$$

2) $y = 2 \sin \frac{\pi}{10} t$

$$x = 2 + 2t - 2 \cos \frac{\pi}{10} t$$

$$A = \int_{t_1}^{t_2} y(t) \cdot \frac{dx}{dt} dt$$

$$A = \int_{10}^{10} \left(2 \sin \frac{\pi}{10} t \times 2 \right) + \left(\frac{2\pi}{5} \sin \frac{\pi}{10} t \right) dt$$

$$A = \int_{10}^{10} 4 \left(\sin \frac{\pi}{10} t \right) \left(1 + \frac{2\pi}{5} \sin \frac{\pi}{10} t \right) dt$$

$$A = 4 \int_{10}^{10} \left[\frac{\sin \pi}{10} + \frac{2\pi}{5} \left(1 - \frac{\cos \pi/5t}{2} \right) \right] dt$$

Integration by part

$$A = 4 \int_{10}^{10} \left[\frac{\sin \pi}{10} + \frac{2\pi}{5} \left(1 - \frac{\cos \pi/5t}{2} \right) \right] dt$$

$$A = 4 \left(\frac{-10}{\pi} \cos \frac{\pi}{10} (10) + \frac{4}{5} \left(10 - \frac{5}{\pi} \sin \frac{\pi}{5} 10 \right) - 4 \left(\frac{-10}{5} \cos \frac{\pi}{10} 0 \right) + \frac{\pi}{5} \left(\frac{0.5}{\pi} \sin \frac{\pi}{5} (0) \right) \right)$$

$$A = 12.73 + 2\pi - (-12.73 + 0)$$

$$A = 31.744 \text{ square unit}$$