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18/ENG04/086
Electrical Electronics Engineering.
ENG 281: Math.

1.) Find the Area bounded by the curve $y = 3e^{2x}$ and $y = 3e^{-x}$ and the coordinates at $x=1$ and $x=2$.

2.) The parametric equations of a curve are $y = 2\sin\frac{\pi}{10}t$ and $x = 2 + 2t - 2\cos\frac{\pi}{10}t$. find the area under the curve between $t=0$ and $t=10$.

Soln

① $y = 3e^{2x}$

$y = 3e^{-x}$

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

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

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

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

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

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

$= 82.30 - 12.18$

$= 70.12$ Square Unit

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

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

$A = \int_{t_1}^{t_2} y(7) \cdot \frac{dx}{dt} \cdot dt$

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

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

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

Integration by Parts.

$A = 4\int_{10}^{10} \sin\frac{\pi}{10} + \frac{2\pi}{5}\int_{10}^{10}\frac{1 - \cos\pi/5t}{2}\int dt$

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

$\left.\frac{\pi}{5}\left(0 \cdot \frac{5}{\pi}\sin\frac{\pi}{5}(0)\right]\right.$

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

$= 31.744$ Square unit