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1. Find the area bounded by the curve $y = 3e^{2x}$ and $y = 3e^{-x}$ and the cordinates 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 $t = 10$.

Answers

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

$y = 3e^{-x}$

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

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

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

$= 3\Big|_1^2 \frac{e^{2x}}{2} - e^{-x}$

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

$=$ [illegible] $(3 \times 27.434403) - (3 \times 4.0624)$

$= 82.30 - 12.18$

$= 70.12$ square unit

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

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

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

$$A = \int_0^{10} \left(2\sin\frac{\pi}{10} t \times 2\right) + \left(\frac{2\pi}{5} \sin\frac{\pi}{10} dt\right)$$

$$A = \int_0^{10} 4 \left(\sin \pi/_{10} t\right)\left(1 + {}^{2\pi}/_5 \sin \pi/_{10} t \, dt\right.$$

$$A = 4 \int_0^{10} \left(\sin\frac{\pi}{10} + \frac{2\pi}{5} \sin \pi/_{10} t\right) dt$$

$$A = 4 \int_0^{10} \sin\frac{\pi}{10} + \frac{2\pi}{5} \left[\frac{1 - \cos \pi/_5 t}{2}\right] dt$$

Integration by parts

$$A = 4 \int_0^{10} \sin\frac{\pi}{10} dt + \frac{2\pi}{10} \int_0^{10} 1 - \cos\frac{\pi}{5} t \, dt$$

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

$$\left.\cos\frac{\pi}{10}(0) + \frac{\pi}{5}\left(0 - \frac{5}{\pi} \sin\frac{\pi}{5}(0)\right)\right]$$

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

$= 31.744$ Square unit