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

$A = \int_{10}^{10} (2 \sin \frac{\pi}{10} \cdot t \times 2) + [\frac{2\pi}{5} \sin \frac{\pi}{10} \, dt]$

$A = \int_{10}^{10} 4 [\sin \pi/10 t] [1 + 2\pi/5 \sin \pi/10 t \, dt]$

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

Integration by parts

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

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

$+ \frac{\pi}{5} \left[\frac{0.5}{\pi} \sin \frac{\pi}{5} [0]\right]$

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

$= 31.744$ Square unit

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Question

(1) Find the Area bounded by the Curve $y = 3e^{2x}$ and $y = 3e^{-x}$ and the Coordinated at $x = 1$ and $x = 2$

(2) The parametric equation of a Curve are $y = 2\sin \pi/10 t$ and $x = 2 + 2t - 2\cos \pi/10 t$. Find the area under the Curve between $t = 0$ and $t = 10$

Solution

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

$y = 3e^{-x}$

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

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

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

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

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

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

$$= 82.30 - 12.18$$

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

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

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