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Q. Solution

$y = 3e^{2x}, \; y = 3e^{-x} \quad x =$

$\cdot A = \int_1^2 y\,dx \Rightarrow \int_1^2 (3e^{2x})\,dx$

$= \left[\frac{3e^{2x}}{2}\right]_1^2$

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

$= \left[81.90 = 11.08\right] = 70.81 \text{ units}^2$

$\cdot A = \int_1^2 y\,dx = \int_1^2 (3e^{-x})\,dx$

$= \left[-3e^{-x}\right]_1^2$

$= \left[-3e^{-2} + 3e^{-1}\right] = 0.698 \text{ units}^2$

$70.81 - 0.698 = 70.116 \text{ units}.$

Q. Solution

$y = 2\sin \pi/10 t, \quad x = 2+2t - 2\cos \pi/10 t$

$t = 0$ and $t = 10$

$A = \int_0^{10} y\,dx$

$\Rightarrow \int_0^{10} (2\sin(\pi/10 t))\,dx$

$dx/dt = 0 + 2 + 2\pi/10 \sin \pi/10 t$

$dx/dt = 2 + \pi/5 \sin \pi/10 t$

$dx = 2 + \pi/5 \sin \pi/10 t \; dt$

$\int_0^{10} (2\sin(\pi/10 t)) \cdot (2 + \pi/5 \sin(\pi/10 t))\,dt$

$\int_0^{10} (4\sin(\pi/10 t)) + (2\pi/5 \sin^2(\pi/10 t))\,dt$

$\int_0^{10} (4\sin(\pi/10 t) + 2\pi/5^2 \sin^2(\pi/10 t))\,dt$

let $\sin^2(\pi/10 t) = \sin^2 a$

recall, $\cos 2a = \cos^2 a - \sin^2 a$

$\cos 2a = (1 - \sin^2 a) - \sin^2 a$

$\cos 2a = 1 - 2\sin^2 a$

$2\sin^2 a = 1 - \cos 2a$

$\sin^2 a = \frac{1}{2} - \frac{\cos 2a}{2}$

$\Rightarrow \sin^2(\pi/10t) = \frac{1}{2} - \frac{\cos 2(\pi/10t)}{2}$

$$\left[\frac{-4\cos(\pi/10t)}{\pi/10}\right]_0^{10} + 2\pi/5 \int_0^{10} \left(\frac{1}{2} - \frac{\cos 2(\pi/10t)}{2}\right)$$

$$\left[\frac{-40\cos(\pi/10t)}{\pi}\right]_0^{10} + 2\pi/5 \left[\frac{t}{2} - \frac{\frac{2\pi}{10}\sin(\pi/5t)}{2}\right]_0^{10}$$

$$\left[\left(\frac{-40\cos(\pi/10 \times 10)}{\pi}\right)\right] - \left[\left(\frac{-40\cos(\pi/10 \times 0)}{\pi}\right)\right]$$

$= 25.46$

$$2\pi/5\left[\left(\frac{10/2 - 2\pi/10 \sin \pi/5 \times 10}{2}\right) - \left(\frac{0/2 - 2\pi/10 \sin \pi/5 \times 0}{2}\right)\right]$$

$\Rightarrow 2\pi = 6.28$

$= 25.46 + 2\pi$

$= 31.74 \text{ units}^2$ //