

Question 2

$$y = 2\sin\frac{\pi}{10}t, \quad x = 2 + 2t - 2\cos\frac{\pi}{10}t \quad @ \quad t=0, t=10$$

$$A = \int_a^b y dx \Rightarrow dx = \left(2 - \frac{2}{5}\sin\frac{\pi}{10}t\right) dt$$

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

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

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

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

$$A = \left[4 \left[\frac{(10\cos\frac{\pi t}{10})}{\pi} \right] + \frac{2\pi}{5} \left[\frac{\pi t - 5\sin\left(\frac{\pi t}{5}\right)}{2\pi} \right] \right]_0^{10}$$

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

$$A = \left[\frac{(-40\cos\frac{\pi(10)})}{\pi} + \frac{\pi(10) - 5\sin\frac{\pi(10)}{5}}{5} \right] - \left[\frac{-40\cos 0}{\pi} + \frac{\pi(0) - 5\sin 0}{5} \right]$$

$$A = \frac{-40}{\pi} + 2\pi - \left(\frac{-40}{\pi} \right) = \frac{-40}{\pi} + \frac{40}{\pi} + 2\pi$$

$$A = 2\pi \text{ unit}^2$$

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Question 1

Area bounded by a curve:

$$A = \int_a^b y dx$$

Area between two curves:

$$A = \int_a^b y_1 dx - \int_a^b y_2 dx$$

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

$$A = 3 \int_1^2 e^{2x} - \left(3 \int_1^2 e^{-x} \right)$$

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

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

$$A = 3 \left(\left[\frac{e^4}{2} + e^{-2} \right] - \left[\frac{e^2}{2} + e^{-1} \right] \right)$$

$$A = 3 \left(\left[27.299 + 0.135 \right] - \left[3.695 + 0.368 \right] \right)$$

$$A = 3(27.434 - 4.063) = 3(23.371)$$

$$A = 70.113 \text{ unit}^2$$