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

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

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

* By trigonometric identities

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

$$\therefore A = 4\int_0^{10}\left(\sin\left(\frac{\pi}{10}t\right) + \left(\frac{\pi}{10}\right)\left(\frac{1}{2}\left(-\cos 2\left(\frac{\pi}{10}t\right) + 1\right)\right)\right)\cdot dt$$

~~$= 4\left[\frac{-10}{\pi}\cos\left(\frac{\pi}{10}t\right)\right.$~~

$$A = 4\int_0^{10}\left(\sin\left(\frac{\pi}{10}t\right) + \left(\frac{\pi}{10}\right)\left(\frac{-\cos 2\left(\frac{\pi}{10}t\right)}{2} + \frac{1}{2}\right)\right)dt$$

$$A = 4\int_0^{10}\left(\sin\left(\frac{\pi}{10}t\right) + \frac{\pi}{20} - \frac{\pi}{20}\cos 2\left(\frac{\pi}{10}t\right)\right)dt$$

~~$A = 4\int_0^{10}$~~ $A = 4\left[\frac{-10}{\pi}\cos\left(\frac{\pi}{10}t\right) + \frac{\pi}{20}t - \left(\frac{\pi}{20}\cdot\frac{5}{\pi}\sin 2\left(\frac{\pi}{10}t\right)\right)\right]_0^{10}$

$$A = 4\left[\frac{-10}{\pi}\cos\left(\frac{\pi}{10}t\right) + \frac{\pi}{20}t - \frac{1}{4}\sin 2\left(\frac{\pi}{10}t\right)\right]_0^{10}$$

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

Taking $\pi = \frac{22}{7}$

$$\therefore A = \left[\frac{-40}{22/7}\cos\left(\frac{22/7}{10}t\right) + \frac{22/7}{5}t - \sin 2\left(\frac{22/7}{10}t\right)\right]_0^{10}$$

$$A = \left[\frac{-40}{22/7}\cos\left(\frac{22/7}{10}(10)\right) + \frac{22/7}{5}(10) - \sin 2\left(\frac{22/7}{10}(10)\right)\right] -$$

OLOGBOSERE ANTHONIA EFE
18/ENG05/049
MECHATRONICS
ENG 281

1. $\int_1^2 y_2\cdot dx = \int_1^2 3e^{2x}\cdot dx$

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

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

$$= 3/2\,(47.2091)$$

$$\int_1^2 y_2\cdot dx = 70.81$$

$$\rightarrow \int_1^2 y_1\cdot dx = \int_1^2 3e^{-x}\cdot dx$$

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

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

$$= 3(0.2325)$$

$$\int_1^2 y_1\cdot dx = 0.69$$

$$\rightarrow A = \int_1^2 y_2\cdot dx - \int_1^2 y_1\cdot dx$$

$$= 70.81 - 0.69$$

$$A = 70.12 \text{ sq-units}$$

2. $A = \int_a^b y\cdot dx$

But $\frac{dx}{dt} = 2 + 2\left(\frac{\pi}{10}\right)\sin\frac{\pi}{10}t$

$$dx = 2 + 2\left(\frac{\pi}{10}\right)\sin\left(\frac{\pi}{10}t\right)\cdot dt$$

$$\left[\frac{-40}{22/7}\cos\left(\frac{22/7}{10}(0)\right)+\frac{22/7}{5}(0)-\sin 2\left(\frac{22/7}{10}(0)\right)\right]$$

$$A=[-12.7081+6.2857-0.1095]-[-12.7273+0-0]$$

$$A=-12.7081+6.2857-0.1095+12.7273$$

$$A=6.1954 \text{ square-units}$$