Ayodeji Moses Afolawa Goodness

Computer Engineering

19/ENG02/004

Maths 104 assignment

2) Find the area under the curve given parametric equations $x = 4t^3 - t^2$ and $y = t^4 + 2t^2$, at $t = 1$ and $t = 3$:

Solution:

Let A represent the area then $A = \int_a^b y\,dx$

where a and b are the limit values for the variable.

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

$$x = 4t^3 - t^2$$

$$dx/dt = 12t^2 - 2t$$

$$dx = 12t^2 - 2t\,dt$$

$$A = \int_1^3 (t^4 + 2t^2)(12t^2 - 2t)\,dt$$

$$A = \int_1^3 12t^6 - 2t^5 + 24t^4 - 4t^3\,dt$$

$$A = \frac{12t^7}{7} - \frac{2t^6}{6_3} + \frac{24t^5}{5} - \frac{4t^4}{4}\Big|_1^3$$

$$A = \frac{12t^7}{7} - \frac{t^6}{3} + \frac{24t^5}{5} - t^4\Big|_1^3$$

$$A = \left(\frac{12(3)^7}{7} - \frac{(3)^6}{3} + \frac{24(3)^5}{5} - (3)^4\right) -$$

$$\left(\frac{1}{7}(1)^7 - \frac{1}{3}(1)^6 + \frac{2}{5}(1)^5 - (1)^4\right)$$

$$A = \frac{160704}{35} - \frac{5544}{105}$$

$$A = \frac{478656}{105}$$

$$A = 4558.4$$

3) If $x = 4t^3 - t^2$ and $y = t^4 + 2t^2$ - find dy/dx

Solution:-

$$x = 4t^3 - t^2 \qquad y = t^4 + 2t^2$$

$$dx/dt = 12t^2 - 2t \qquad dy/dt = 4t^3 + 4t$$

$$\frac{dy}{dx} = \frac{dy}{dt} \times \frac{dt}{dx}$$

$$\frac{dy}{dt} = 4t^3 + 4t, \quad \frac{dt}{dx} = \frac{1}{dx/dt}$$

$$\frac{dt}{dx} = \frac{1}{12t^2 - 2t}$$

$$\frac{dy}{dx} = \frac{4t^3 + 4t}{1} \times \frac{1}{12t^2 - 2t} = \frac{4t^3 + 4t}{12t^2 - 2t}$$

$$\frac{dy}{dx} = \frac{2t(2t^2 + 2)}{2t(6t - 1)}$$

$$\therefore \frac{dy}{dx} = \frac{2t^2 + 2}{6t - 1}$$