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Matric No - 19/Engo2/016

MAT 104 12-05-2020 to 15-05-2020.

1) $y = \sin(6/x^2)$

$y = \sin(6x^{-2})$

$y + \Delta y = \sin 6(x+\Delta x)^{-2}$

$y + \Delta y = \sin(6x^{-2} + \Delta x^{-2})$

$\Delta y = \sin 6x^{-2} + 6x\Delta^{-2}) - y$

$\Delta y = \sin 6(x^{-2} + 6x\Delta^{-2}) - \sin 6x^{-2}$

$2\cos\frac{(A+B)}{2} \sin\frac{(A-B)}{2}$

$\Delta y = 2\cos\frac{(6x^{-2} + 6\Delta x^{-2} + 6x^{-2})}{2} \sin\frac{(6x^{-2} + 6\Delta x^{-2} - 6x^{-2})}{2}$

$\Delta y = 2\cos\frac{(12x^{-2} + 6\Delta x^{-2})}{2} \sin\frac{(6\Delta x^{-2})}{2}$

Divide through by Δx

$\frac{\Delta y}{\Delta x} = 2\cos\frac{(12x^{-2} + 6\Delta x^{-2})}{2} \sin\frac{(6\Delta x^{-2})}{2}$

$\frac{}{\Delta x}$

$\cos\frac{(12x^{-2} + 6\Delta x^{-2})}{2} \sin\frac{(6\Delta x^{-2})}{2}$

$\lim_{\Delta x \to 0} \cos\frac{(12x^{-2} + 6(0)^{-2})}{2} \frac{\sin\frac{6\Delta x^{-2}}{2}}{\frac{\Delta x}{2}} \to 1$

$dy/dx = \cos 12x^{-2}/2$

$dy/dx = \cos 6x^{-2}$

2

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

$t = 1$ and $t = 3$

$A = \int_a^b f(x)\,dx \quad y = f(x)$

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

let

$x = f(t)$ and $y = g(t)$

$\frac{dx}{dt} = f'(t)$ and $dx = f'(t)\,dt$

$A = \int g(t) \cdot f'(t)\,dt$

$A = \int [t^4 + 2t^2) \cdot x (12t^2 - 2t)$

$A = \left[\frac{t^5}{5} + \frac{2t^2}{2}\right] \left[\frac{12t^3}{3} - \frac{2t^2}{2}\right]$

at $t = 1$

$A = \left[\frac{1^5}{5} + \frac{2}{2}\right] \times \left[\frac{12}{3} - \frac{2}{2}\right]$

$= \left[\frac{1}{5} + 1\right] \left[4 - 1\right]$

$= \frac{6}{5} \times 3$

$= 18/5$

At $t = 3$

$A = \left[\frac{3^5}{5} + \frac{2(3)^2}{2}\right] \left[\frac{12(3)^3}{3} - \frac{2(3)^2}{2}\right]$

$= \left[\frac{243}{5} + 9\right] \times \left[108 - 9\right]$

$A = [57.67 \times 99)$

$A = 5702.4$

Upper bound

$= 5702.4 - 1.8 = 5698.8$ units

3) $x = 4t^3 - t^2$, $y = t^4 + 2t^2$

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

$dy/dt = 4t^3 + 4t$

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

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

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

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

$dy/dx = \frac{1}{3} - 2 + \frac{1}{3}t^2 - 2$

$dy/dx = 1 + \frac{1}{3}t^2 - 2$