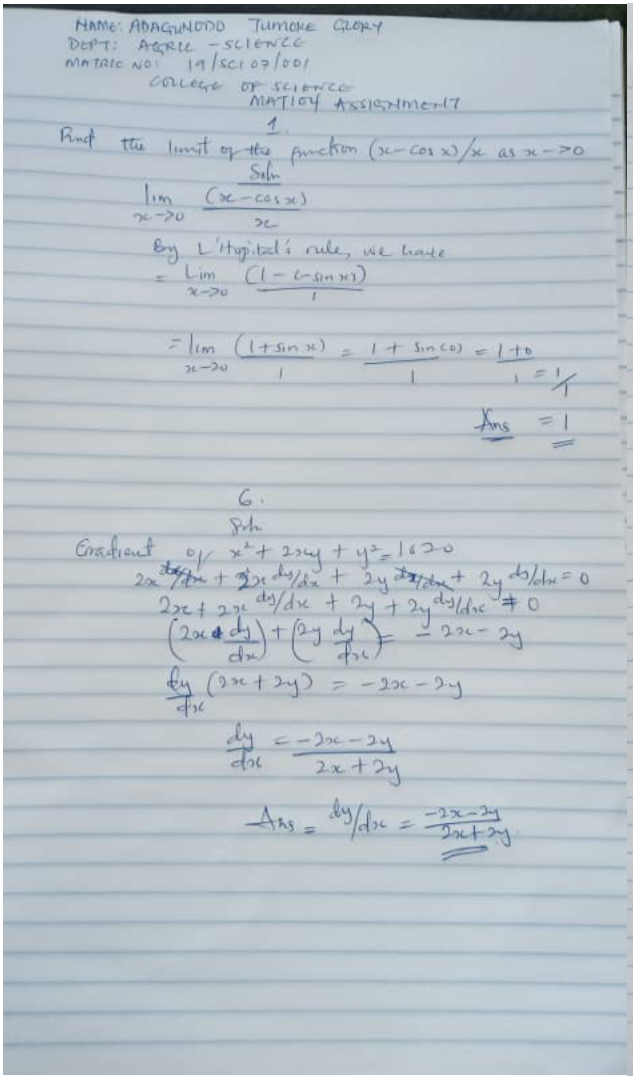
ADAGUNODO JUMOKE GLORY

MAT104 ASSIGNMENT

Agricultural Science - Dept

19/SCI07/001



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DEPT: AGRIC - SCIENCE
MATRIC NO: 19/SCI07/001
COLLEGE OF SCIENCE
MAT104 Assignment

1.

Find the limit of the function $(x-\cos x)/x$ as $x \to 0$

Soln

$$\lim_{x\to 0} \frac{(x-\cos x)}{x}$$

By L'Hopital's rule, we have

$$= \lim_{x\to 0} \frac{(1-(-\sin x))}{1}$$

$$= \lim_{x\to 0} \frac{(1+\sin x)}{1} = \frac{1+\sin(0)}{1} = \frac{1+0}{1} = 1$$

Ans = 1

6.

Soln

Gradient of $x^2 + 2xy + y^2 = 1620$

$$2x\frac{dx}{dx} + 2x\,dy/dx + 2y\frac{dx}{dx} + 2y\,dy/dx = 0$$

$$2x + 2x\,dy/dx + 2y + 2y\,dy/dx = 0$$

$$\left(2x\frac{dy}{dx}\right) + \left(2y\frac{dy}{dx}\right) = -2x - 2y$$

$$\frac{dy}{dx}(2x+2y) = -2x-2y$$

$$\frac{dy}{dx} = \frac{-2x-2y}{2x+2y}$$

Ans = $dy/dx = \frac{-2x-2y}{2x+2y}$

2.

If $y = -3\tan 7x\, e^{3x}$. Find dy/dx

Solution

$u = -3 \quad v = \tan 7x \quad w = e^{3x}$

$du/dx = 0 \quad dv/dx = 7\sec^2 7x \quad dw/dx = 3e^{3x}$

$$dy/dx = y\left[\frac{1}{-3}(0) + \frac{1}{\tan 7x}(7\sec^2 7x) + \frac{1}{e^{3x}}(3e^{3x})\right]$$

$$dy/dx = [y]\left[0 + \frac{7\sec^2 7x}{\tan 7x} + 3\right]$$

$$dy/dx = \left[\frac{7\sec^2 7x}{\tan 7x} + 3\right]\left[-3\tan 7x\, e^{3x}\right]$$

3.

If $y = \cos 3x$. Find dy/dx from the first principle

Solution

$y = \cos 3x$

$y + \Delta y = \cos(3x + \Delta x)$

$\Delta y = \cos(3x+\Delta x) - \cos 3x$ ——(1)

Recall: $\cos A - \cos B = -2\sin\frac{A+B}{2}\sin\frac{A-B}{2}$

Comparing equation 1 & 2.

$A = 3x + \Delta x \quad B = 3x$

$$\frac{A+B}{2} = \frac{3x+\Delta x+3x}{2} = \frac{6x+\Delta x}{2} = 6x + \frac{\Delta x}{2}$$

and

$$\frac{A-B}{2} = \frac{3x+\Delta x-3x}{2} = \frac{\Delta x}{2}$$

Hence;

$$\Delta y = \cos(3x+\Delta x) - \cos 3x$$

$$= -2\sin\left(6x + \frac{\Delta x}{2}\right)\sin\frac{\Delta x}{2}$$

Divide through by Δx

$$\Delta y/\Delta x = \left[-2\sin\left(6x+\frac{\Delta x}{2}\right)\left(\sin\frac{\Delta x}{2}\right)\right]\div \Delta x$$

NB $\lim_{\theta \to 0} \frac{\sin\theta}{\theta} = 1$, $\frac{\sin B}{B} = 1$

$$\frac{\Delta y}{\Delta x} = \frac{-2\sin\left(\frac{6x+\Delta x}{2}\right)\left(\sin\frac{\Delta x}{2}\right) \times 1/2}{\Delta x \times 1/2}$$

$$\lim_{\Delta x \to 0}\frac{\Delta y}{\Delta x} = -2\sin(6x+0)\lim_{\Delta x \to 0}\frac{\sin\left(\frac{\Delta x}{2}\right)}{\Delta x/2}$$

Since $\lim_{\Delta x \to 0}\frac{\sin\left(\frac{\Delta x}{2}\right)}{\Delta x/2} = 1$

Therefore: $dy/dx = -2\sin 6x$

4.

$f(x) = 2x^3 - 7x$ and $g(x) = -3x$

$[f-g](5) = f(5) - g(5)$

$(f-g)(5) = [2(5)^3 - 7(5)]\ [-3(5)]$

$(f-g)(5) = [2(125) - 35] - [-15]$

$(f-g)(5) = 250 - 35 + 15$

$(f-g)(5) = 230$

$\therefore (f-g)(5) = 230$

5.

Find $fog(x)$ if $f(x) = 4x^2 + 2$ and $g(x) = 2x + 3$

Solution

$f(g(x)) = 4[2x+3]^2 + 2$

$= 4[4x^2 + 12x + 9] + 2$

$= 16x^2 + 48x + 36 + 2$

$= 16x^2 + 48x + 38.$

Ans $f(g(x)) = 16x^2 + 48x + 38$

7.

~~Find~~ to find first derivative of the function $y = x^2\cos x$

$y = x^2\cos x$

1st derivative $= 2x - \sin x$