

Name: Geometric Exercise 1
 Date: 16/ENR 05/2014
 Department: Electronics Engineering
 Course code: ENR 281

Question

$$\lim_{x \rightarrow \pi/2} \left[\frac{(x^2 - \pi/4) \sin(\cos x)}{x - \pi/2} \right]$$

Soln

$$\text{let } y = (x^2 - \pi/4) \sin(\cos x)$$

$$u = x^2 - \pi/4$$

$$v = \sin(\cos x)$$

$$\frac{du}{dx} = 2x$$

$$\text{let } a = \sin, b = \cos x$$

$$\frac{dv}{dx} = A \frac{db}{dx} + B \frac{da}{dx}$$

$$= \sin x \cdot -\sin x + \cos x \cdot \cos x$$

$$\frac{dv}{dx} = -\sin^2 x + \cos^2 x$$

$$\frac{dy}{dx} = u \frac{dv}{dx} + v \frac{du}{dx}$$

$$= (x^2 - \pi/4) (-\sin^2 x + \cos^2 x) + (\sin(\cos x)) (2x)$$

$$\text{let } w = x - \pi/2, \frac{dw}{dx} = 1$$

$$\therefore \text{let } T = \left[\frac{(x^2 - \pi/4) \sin(\cos x)}{x - \pi/2} \right]$$

$$\frac{dT}{dx} = \left[\frac{(x^2 - \pi/4) (-\sin^2 x + \cos^2 x) + (\sin(\cos x)) (2x)}{x - \pi/2} \right]$$

$$\lim_{x \rightarrow \pi/2} \frac{dT}{dx} = \left[\frac{(\frac{\pi}{2})^2 - \pi/4}{1} \left[-\sin(\frac{\pi/2})^2 + \cos(\frac{\pi/2})^2 \right] + \left[\sin(\cos(\frac{\pi/2})) \cdot 2(\frac{\pi/2}) \right] \right]$$

$$= \left(\frac{\pi^2 - \pi}{4} \right) (-1 + 0) + (0 \times \pi)$$

$$= \frac{-\pi^2 + \pi}{4}$$

$$= \frac{-\pi}{4} (\pi - 1)$$

$$\therefore \lim_{x \rightarrow \pi/2} \left[\frac{(x^2 - \pi/4) \sin(\cos x)}{x - \pi/2} \right] = \frac{-\pi}{4} (\pi - 1)$$