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16/ENG05/010

Mechatronics Engineering

ENG 281 Assignment

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

Solution

$$\frac{u}{v}, \quad \frac{u'}{v'} = ?$$

$$\text{For } u = x^2 \sin(\cos x) - \frac{\pi}{4} \sin(\cos x)$$

$$w = \cos x, \quad y = \sin w$$

$$\frac{dw}{dx} = -\sin x, \quad \frac{dy}{dw} = \cos(w)$$

$$\frac{dy}{dx} = \frac{dy}{dw} \cdot \frac{dw}{dx} = \cos(w) \cdot (-\sin x)$$

$$\frac{dy}{dx} = \cos(\cos x) (-\sin x)$$

By Product rule

$$a = x^2$$

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

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

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