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16LENG06/006

Mechanical Engineering  
EMA 281 Assignment

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

solution

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

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

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

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

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

for denominator let  $k = x - \pi/2$

$$\frac{dk}{dx} = 1$$

$$\frac{dx}{dk} = 1$$

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

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

$$\lim_{x \rightarrow \pi/2} \left[ \frac{(x^2 - \pi/4) \sin(\cos x)}{x - \pi/2} \right] = \frac{\left(\frac{\pi^2}{4} - \frac{\pi}{4}\right)(-1) + 0}{4} = \frac{-\pi^2 + \pi}{4}$$

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

$$2b \lim_{x \rightarrow \pi/2} \ln \left[ \frac{\exp(3x^2 + 2x - 1)}{x + 1} \right]$$

$\Rightarrow$