

### Answer on Question # 41154 – Math - Integral Calculus

Can L' Hospital's rule be applied to evaluate the limit  $\lim_{x \rightarrow \pi/2} (1 - \sin x) / \cos x$ . If yes, evaluate the limit.

#### Solution.

Because the functions  $f(x) = 1 - \sin x$  and  $g(x) = \cos x$  are differentiable on an open interval containing  $\pi/2$  and  $f\left(\frac{\pi}{2}\right) = g\left(\frac{\pi}{2}\right) = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$ ,  $g'(x) \neq 0$  we can apply L'Hospital's rule.

We have the limit:

$$\lim_{x \rightarrow \frac{\pi}{2}} \frac{1 - \sin x}{\cos x}$$

Evaluate the limit:

$$\lim_{x \rightarrow \frac{\pi}{2}} \frac{1 - \sin x}{\cos x} = \left[ \frac{1 - \sin \frac{\pi}{2}}{\cos \frac{\pi}{2}} \right] = \left[ \frac{0}{0} \right]$$

Then we can use L'Hopital's rule:

$$\lim_{x \rightarrow \frac{\pi}{2}} \frac{1 - \sin x}{\cos x} = \lim_{x \rightarrow \frac{\pi}{2}} \frac{-\cos x}{-\sin x} = \lim_{x \rightarrow \frac{\pi}{2}} \cot x = \cot \frac{\pi}{2} = 0$$

**Answer:**

$$\lim_{x \rightarrow \frac{\pi}{2}} \frac{1 - \sin x}{\cos x} = 0$$