

Assignment 2

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Problem (iv), ICSE 12 2017:

Using L'Hospital's Rule, evaluate:

$$\lim_{x \rightarrow \pi/2} x \tan x - \pi/2 \sec x$$

Solution:

we know that,

if there is a function $f(x) = \frac{g(x)}{h(x)}$

then by L'Hospital's Rule

$$\lim_{x \rightarrow x_0} f(x) = \lim_{x \rightarrow x_0} \frac{g(x)}{h(x)} \quad (1)$$

$$= \lim_{x \rightarrow x_0} \frac{g'(x)}{h'(x)} \quad (2)$$

so, by equation (2),

$$\lim_{x \rightarrow \pi/2} x \tan x - \pi/2 \sec x = \lim_{x \rightarrow \pi/2} \frac{d(2x \sin x - \pi)}{dx} \frac{dx}{d(2 \cos x)} \quad (3)$$

$$= \lim_{x \rightarrow \pi/2} \frac{2x \cos x + 2 \sin x}{-2 \sin x} \quad (4)$$

Now, putting value of $x = \pi/2$, we get -1