Assignment 2

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Problem 1(viii), ICSE 12 2019:
Using L'Hospital's Rule, evaluate:
$\lim_{x\to\pi/2}\ xtanx - \pi/2secx$
Solution:
we know that,
if there is a function $f(x) = \frac{g(x)}{h(x)}$
then by L'Hospital's Rule

$$\lim_{x\to x_0} f(x) = \lim_{x\to x_0} \frac{g(x)}{h(x)} \tag{1}$$

$$= \lim_{x\to x_0} \frac{g'(x)}{h'(x)} \tag{2}$$

so,by equation (2),

$$\lim_{x\to\pi/2} xtanx - \pi/2secx = \lim_{x\to\pi/2} \frac{\mathrm{d}(2xsinx - \pi)}{\mathrm{d}x} \frac{\mathrm{d}x}{\mathrm{d}(2cosx)} \tag{3}$$

$$= \lim_{x\to\pi/2} \frac{2xcosx + 2sinx}{-2sinx} \tag{4}$$

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