

Math 221 Sec 003 Quiz 4

1. Compute the following limit (Don't use the L'Hopital's rule):

$$\lim_{x \rightarrow 0} \frac{x}{\tan x}$$

Solution:

$$\begin{aligned} \lim_{x \rightarrow 0} \frac{x}{\tan x} &= \frac{\cos x}{\left(\frac{\sin x}{x}\right)} \\ &= \frac{\lim_{x \rightarrow 0} \cos x}{\lim_{x \rightarrow 0} \frac{\sin x}{x}} && \text{(extract } \sin x/x +3) \\ &= \frac{1}{1} && \text{(correct limits +1)} \\ &= 1 && \text{(correct answer +1)} \end{aligned}$$

Be flexible with this one, because there are many ways to go about this.

2. Differentiate the following function:

$$y = \sec((2x + 1)^3)$$

Solution:

$$\begin{aligned} \frac{dy}{dx} &= ((2x + 1)^3)' \sec((2x + 1)^3) \tan((2x + 1)^3) && \text{(correct derivative of sec +1)} \\ & && \text{(chain rule +2)} \\ &= (2x + 1)' \cdot 3(2x + 1)^2 \sec((2x + 1)^3) \tan((2x + 1)^3) && \text{(correct derivative of } x^3 +1) \\ &= 6(2x + 1)^2 \sec((2x + 1)^3) \tan((2x + 1)^3) && \text{(correct answer +1)} \end{aligned}$$