

AP Calculus Limits Containing Trig. Functions Critical Homework(Answers)

$$\begin{array}{lll}
 1b) \quad \lim_{x \rightarrow 0} \sec 2x & 1c) \quad \lim_{x \rightarrow 3} \tan\left(\frac{\pi x}{4}\right) & 1d) \quad \lim_{x \rightarrow 2} \cot\left(\frac{3\pi}{2}x\right) \\
 = \sec 0 = 1 & = \tan \frac{3\pi}{4} = -1 & = \cot(3\pi) = DNE
 \end{array}$$

$$\begin{array}{lll}
 2b) \quad \lim_{x \rightarrow 0} \frac{\sin x(1 - \cos x)}{x^2} & 2c) \quad \lim_{x \rightarrow 0} \frac{\sin^2 x}{x} & 2d) \quad \lim_{x \rightarrow 0} \frac{2x}{3\sin 3x} \cdot \frac{3}{3} \\
 = \lim_{x \rightarrow 0} \left[\frac{\sin x}{x} \cdot \frac{1 - \cos x}{x} \right] & = \lim_{x \rightarrow 0} \left[\frac{\sin x}{x} \sin x \right] & \lim_{x \rightarrow 0} \frac{2}{9} \cdot \frac{3x}{\sin 3x} \\
 = (1)(0) = 0 & = (1) \sin 0 = 0 & = \frac{2}{9} \cdot 1 \\
 & & = \frac{2}{9}
 \end{array}$$

$$\begin{array}{lll}
 2e) \quad \lim_{x \rightarrow \pi/2} \frac{\cos x}{\sin x} = 1 & 2f) \quad \lim_{h \rightarrow 0} \frac{(1 - \cos h)^2}{h} & 2g) \quad \lim_{t \rightarrow 0} \frac{\sin 3t}{2t} \\
 = \lim_{x \rightarrow \pi/2} \frac{\cos x}{\sin x} = 1 & = \lim_{h \rightarrow 0} \left[\frac{1 - \cos h}{h} (1 - \cos h) \right] & = \lim_{t \rightarrow 0} \left(\frac{\sin 3t}{3t} \right) \left(\frac{3}{2} \right) \\
 & = (0)(0) = 0 & = (1) \left(\frac{3}{2} \right) = \frac{3}{2}
 \end{array}$$

$$\begin{aligned}
 2g) \quad \lim_{x \rightarrow \pi/4} \frac{1 - \tan x}{\sin x - \cos x} &= \lim_{x \rightarrow \pi/4} \frac{1 - \frac{\sin x}{\cos x}}{\sin x - \cos x} \cdot \frac{\cos x}{\cos x} = \lim_{x \rightarrow \pi/4} \frac{\cos x - \sin x}{\cos x(\sin x - \cos x)} \\
 &= \lim_{x \rightarrow \pi/4} \frac{-1}{\cos x} = \lim_{x \rightarrow \pi/4} (-\sec x) = -\sqrt{2}
 \end{aligned}$$