
Complete the following problems. Show all work to receive full credit.

1. Evaluate $\lim_{t \rightarrow 0} \frac{\cos t - 1}{e^t - t - 1}$

$$\begin{aligned} &= {}^{LH} \lim_{t \rightarrow 0} \frac{-\sin t}{e^t - 1} \\ &= {}^{LH} \lim_{t \rightarrow 0} \frac{-\cos t}{e^t} \\ &= \frac{-1}{1} = -1 \end{aligned}$$

2. Evaluate $\lim_{x \rightarrow 0^+} (\sin x)^{\tan x}$

$$\begin{aligned} &= \lim_{x \rightarrow 0^+} e^{\tan x \ln \sin x} \\ &= e^{\lim_{x \rightarrow 0^+} \tan x \ln \sin x} \end{aligned}$$

Let's examine the limit:

$$\begin{aligned} \lim_{x \rightarrow 0^+} \tan x \ln \sin x &= \lim_{x \rightarrow 0^+} \frac{\ln \sin x}{\cot x} \\ &= {}^{LH} \lim_{x \rightarrow 0^+} \frac{\frac{\cos x}{\sin x}}{-\csc^2 x} \\ &= \lim_{x \rightarrow 0^+} \frac{\cos x}{\sin x} \cdot -\sin^2 x \\ &= \lim_{x \rightarrow 0^+} -\cos x \sin x = 0 \end{aligned}$$

Plugging back in, this gives the limit:

$$e^0 = 1$$