

Math141 Exam 2 Problem 4

October 2014

Problem 4.

$$\lim_{x \rightarrow 0^+} \sin(x) \log_2(\sin(x))$$

$$\begin{aligned} \lim_{x \rightarrow 0^+} \sin(x) \log_2(\sin(x)) &= \lim_{x \rightarrow 0^+} \sin(x) \frac{\ln(\sin(x))}{\ln(2)} \\ &= \frac{1}{\ln(2)} \lim_{x \rightarrow 0^+} \frac{\ln(\sin(x))}{1/\sin(x)} \end{aligned}$$

The limit is now in a form that L'Hopital's Rule can be applied to.

$$\begin{aligned} \frac{1}{\ln(2)} \lim_{x \rightarrow 0^+} \frac{\ln(\sin(x))}{1/\sin(x)} &= \frac{1}{\ln(2)} \lim_{x \rightarrow 0^+} \frac{\cot(x)}{-\csc(x) \cot(x)} \\ &= \frac{1}{\ln(2)} \lim_{x \rightarrow 0^+} -\sin(x) \\ &= 0 \end{aligned}$$