

NAME: Solution

MAC 2311 Section 6462

Quiz Two

Please show all of your work in a NEAT and ORGANIZED fashion.

1. (2 points) Evaluate the limit, if it exists. If the limit does not exist, explain why.

$$\begin{aligned}\lim_{h \rightarrow 0} \frac{(\sqrt{25+h}-5)(\sqrt{25+h}+5)}{h(\sqrt{25+h}+5)} &= \\ \lim_{h \rightarrow 0} \frac{25+h-25}{h(\sqrt{25+h}+5)} &= \\ \lim_{h \rightarrow 0} \frac{1}{\sqrt{25+h}+5} &= \frac{1}{\sqrt{25}+5} = \frac{1}{10}\end{aligned}$$

2. (2 points) Evaluate the limit, if it exists. If the limit does not exist, explain why.

$$\begin{aligned}\lim_{x \rightarrow 1^+} \frac{x^2+4x-5}{|x-1|} &= \lim_{x \rightarrow 1^+} \frac{(x+5)(x-1)}{x-1} = \lim_{x \rightarrow 1^+} x+5 = 6 \\ \lim_{x \rightarrow 1^-} \frac{x^2+4x-5}{|x-1|} &= \lim_{x \rightarrow 1^-} \frac{(x+5)(x-1)}{-(x-1)} = \lim_{x \rightarrow 1^-} -x-5 = -6\end{aligned}$$

The left-hand and right-hand limits are not equal, so the limit does not exist.

3. (2 points) Explain why the function $f(x)$ is discontinuous at $x = -2$:

$$f(x) = \begin{cases} \frac{x^2-4}{x+2} & \text{if } x \neq -2 \\ 3 & \text{if } x = -2 \end{cases}$$

$$\begin{aligned}\lim_{x \rightarrow -2} f(x) &= \lim_{x \rightarrow -2} \frac{x^2-4}{x+2} = \lim_{x \rightarrow -2} \frac{(x+2)(x-2)}{x+2} = \lim_{x \rightarrow -2} x-2 = -4 \\ \lim_{x \rightarrow -2} f(x) &= -4, \text{ but } f(-2) = 3, \\ \text{So } \lim_{x \rightarrow -2} f(x) &\neq f(-2),\end{aligned}$$