

Math 1231 Fall 2023
Single-Variable Calculus I Section 13
Skills Quiz 1: Computing Limits
Friday, February 2 2024

Name:

Recitation Section:

For all these problems, justify your answers and explain how you reached them. (Remember you should *not* use L'Hospital's Rule!) Do not just give a single number. Make sure you use your notation correctly.

(a) $\lim_{x \rightarrow 2} \frac{x^2 + 2x - 8}{x - 2} =$

Solution:

$$\begin{aligned} \lim_{x \rightarrow 2} \frac{x^2 + 2x - 8}{x - 2} &= \lim_{x \rightarrow 2} \frac{(x - 2)(x + 4)}{x - 2} \\ &= \lim_{x \rightarrow 2} x + 4 = 6. \end{aligned}$$

(b) $\lim_{x \rightarrow -1} \frac{\sqrt{x + 2} - 1}{x + 1} =$

Solution:

$$\begin{aligned} \lim_{x \rightarrow -1} \frac{\sqrt{x + 2} - 1}{x + 1} &= \lim_{x \rightarrow -1} \frac{x + 2 - 1}{(x + 1)(\sqrt{x + 2} + 1)} \\ &= \lim_{x \rightarrow -1} \frac{x + 1}{(x + 1)(\sqrt{x + 2} + 1)} \\ &= \lim_{x \rightarrow -1} \frac{1}{\sqrt{x + 2} + 1} = \frac{1}{2}. \end{aligned}$$

(c) $\lim_{x \rightarrow 0} \frac{\sin(2x)}{\sin(3x)} =$

Solution:

$$\begin{aligned}\lim_{x \rightarrow 0} \frac{\sin(2x)}{\sin(3x)} &= \lim_{x \rightarrow 0} \frac{\frac{\sin(2x)}{2x} \cdot 2x}{\frac{\sin(3x)}{3x} \cdot 3x} \\ &= \lim_{x \rightarrow 0} \frac{2x}{3x} = \lim_{x \rightarrow 0} \frac{2}{3} = 2/3.\end{aligned}$$

$$(d) \lim_{x \rightarrow 2} \frac{-3}{(x-2)^2} =$$

Solution:

$$\lim_{x \rightarrow 2} \frac{-3 \nearrow^{-3}}{(x-2)^2 \searrow_{0^+}} = -\infty.$$