

Math 131 - Assignment 3

January 31, 2024

Name _____

Score _____

Show all work to receive full credit. Evaluate all limits analytically. Supply explanations when necessary. This assignment is due February 7.

1. In each part below, determine analytically (not with a table or graph) whether the limit is $+\infty$, $-\infty$, or DNE. Show work or explain your reasoning.

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

(b) $\lim_{x \rightarrow 2^+} \frac{x}{x-2}$

(c) $\lim_{x \rightarrow 2} \frac{x}{x-2}$

(d) $\lim_{x \rightarrow 2} \frac{x}{(x-2)^4}$

2. Evaluate $\lim_{x \rightarrow -3^+} h(x)$, where $h(x) = \begin{cases} \tan(\pi x/2), & x < -3 \\ 2x^2 + x \cos(\pi x), & x > -3 \end{cases}$

3. Evaluate the limit: $\lim_{w \rightarrow 4^-} \frac{2w^2 - 8w}{w^2 - 8w + 16}$

4. Evaluate the limit: $\lim_{x \rightarrow 0^+} \frac{\sin 2x}{\sin 5x}$.

Turn over.

5. Determine all vertical asymptotes of the graph of $h(x) = \frac{x^2 + 2x - 8}{x^2 - 4}$.
(You can use your graphing calculator for help, but you must show computational work for credit.)

6. Find the numbers a and b so that f is continuous everywhere.

$$f(x) = \begin{cases} x^2 + ax + b, & x < 3 \\ bx + a, & x = 3 \\ x^3 - 9x + bx^2, & x > 3 \end{cases}$$

7. Find and classify the discontinuities of $R(x) = \frac{2x^2 - 5x - 3}{x^2 + 4x - 21}$.

8. Suppose that the function f satisfies

$$1 - x \leq f(x) \leq 1 - x + \frac{x^2}{2}$$

for all x -values. Determine the limit, $\lim_{x \rightarrow 0} f(x)$, and explain your reasoning.