

# Math 131 - Assignment 3

February 5, 2025

Name \_\_\_\_\_

Score \_\_\_\_\_

Show all work to receive full credit. Evaluate all limits analytically. Supply explanations when necessary. This assignment is due February 12.

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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 at  $x = 3$ .

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

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

8. Suppose that the function  $f$  satisfies

$$1 - \frac{(2x - \pi)^2}{8} \leq f(x) \leq 1 - \frac{(2x - \pi)^2}{8} + \frac{(2x - \pi)^4}{384}$$

for all  $x$ -values. Determine the limit,  $\lim_{x \rightarrow \pi/2} f(x)$ , and explain your reasoning.