

# MEMORIAL UNIVERSITY OF NEWFOUNDLAND

## DEPARTMENT OF MATHEMATICS AND STATISTICS

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ASSIGNMENT 2

MATHEMATICS 1000

FALL 2023

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**Due: Monday, September 25th, 2023 at 4:00pm. SHOW ALL WORK.**

**Note:** You should complete the WebAssign problem sets “Basic Limit Properties” and “Evaluating Limits Algebraically”, as well as Worksheets 1.3 and 1.4, before you work on this assignment.

1. Use analytical methods to evaluate each of the following limits. If a limit does not exist, explain why. Assign  $\infty$  or  $-\infty$  to the limit where appropriate.

(a)  $\lim_{x \rightarrow -2} \frac{\sqrt{2-x} - 2}{3 - \sqrt{4x+17}}$

(b)  $\lim_{t \rightarrow 5} [t(t^2 - 25)^{-1} - (t^2 - 8t + 15)^{-1}]$

(c)  $\lim_{x \rightarrow 0} \frac{1 - \cos^2(x)}{1 - \cos^2(4x)}$

2. Find all values of  $k$  for which  $\lim_{x \rightarrow 4} f(x)$  exists, given

$$f(x) = \begin{cases} (x+k)^2, & \text{for } x > 4 \\ k^3, & \text{for } x = 4 \\ 2x - k, & \text{for } x < 4. \end{cases}$$

3. Determine all the vertical asymptotes, if any, of the function

$$f(x) = \frac{30x^2 - 5x^4 - 5x^3}{x^4 - 4x^3 + 4x^2}.$$

For each vertical asymptote, assign  $\pm\infty$  to the lefthand and righthand limits.