MEMORIAL UNIVERSITY OF NEWFOUNDLAND

DEPARTMENT OF MATHEMATICS AND STATISTICS

ASSIGNMENT 3 **MATHEMATICS 1000** FALL 2024

Due: Tuesday, October 1st, 2024 at 11:59pm. See the Gradescope Handout for submission information.

> **Note:** You should complete the WeBWorK problem set "Limits at Infinity", as well as Worksheets 1.5, 1.6 and 1.7, before you work on this assignment.

1. Find all the horizontal asymptotes, if any, of the function

$$f(x) = \frac{3 - 4x}{2x + \sqrt{16x^2 - x - 5}}.$$

2. Given the function

$$f(x) = \begin{cases} (kx)^2 - 3kx + k, & x \neq -2 \\ 9 - 2k, & x = -2 \end{cases}$$

use the definition of continuity to determine all values of the constant k for which $f(x)$ is continuous at $x = -2$.

3. Given the function

$$f(x) = \begin{cases} \dfrac{x^2 + 5x + 4}{x^2 + 3x - 4}, & \text{for } x \leq 0 \\ x - 1, & \text{for } 0 < x \leq 2 \\ \dfrac{x^2 - 7x + 10}{x^2 - 10x + 25}, & \text{for } x > 2 \end{cases}$$

use the definition of continuity to investigate the continuity of $f(x)$ at each of the following. Classify any discontinuities as removable or non-removable.

   (a) $x = 0$

   (b) $x = 2$

   (c) any other points where $f(x)$ is discontinuous