

# MEMORIAL UNIVERSITY OF NEWFOUNDLAND

## DEPARTMENT OF MATHEMATICS AND STATISTICS

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ASSIGNMENT 3

MATHEMATICS 1000

FALL 2022

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**Due: Wednesday, October 12th, 2022 at 11:59pm.** Show all work. See the Gradescope Handout for submission information.

**Note:** You should complete the WebAssign 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 to the graph of the function

$$f(x) = \frac{7 - x}{5x + \sqrt{16x^2 - 3x + 4}}.$$

2. Given the function

$$f(x) = \begin{cases} kx^2 - 2kx, & \text{for } x < 3 \\ \frac{3k}{3k + 5}, & \text{for } x = 3 \\ 4x - 9k^2, & \text{for } x > 3 \end{cases}$$

use the definition of continuity to determine all values of the constant  $k$  for which  $f(x)$  is continuous at  $x = 3$ .

3. Given the function

$$f(x) = \begin{cases} \frac{x^2 + 6x + 9}{x^2 - 9}, & \text{for } x < -2 \\ x^2 + 3x - 6, & \text{for } -2 \leq x < 1 \\ \frac{x^2 + x - 20}{x^2 - 8x + 16}, & \text{for } x \geq 1 \end{cases}$$

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)  $x = -2$
- (b)  $x = 1$
- (c) any other points where  $f(x)$  is discontinuous