

# MEMORIAL UNIVERSITY OF NEWFOUNDLAND

DEPARTMENT OF MATHEMATICS AND STATISTICS

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ASSIGNMENT 4

MATHEMATICS 1000

FALL 2024

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**Due: Friday, October 18th, 2024 at 11:59pm.** See the Gradescope Handout for submission information.

**Note:** For this assignment, differentiation may be performed only by using the limit definition of the derivative. (The alternative limit definition may also be used, where appropriate.) You should complete Worksheet 2.2 before you work on this assignment.

- Use the limit definition of the derivative to differentiate  $f(x) = \frac{x+1}{x-3}$ .
- Consider the function  $f(x) = \sqrt{5x-1}$ .
  - Use the limit definition to find the derivative  $f'(x)$ .
  - Determine the equation of the line that is tangent to the curve  $y = f(x)$  at the point  $x = 2$ .
- Given that each of the following functions is continuous at  $x = -4$ , determine whether they are also differentiable at  $x = -4$ .
  - $f(x) = \begin{cases} x^2 - 7, & \text{for } x \geq -4 \\ 2x^2 + 8x + 9, & \text{for } x < -4 \end{cases}$
  - $g(x) = \begin{cases} x^2 - 7, & \text{for } x \geq -4 \\ 1 - 2x, & \text{for } x < -4 \end{cases}$