MEMORIAL UNIVERSITY OF NEWFOUNDLAND

DEPARTMENT OF MATHEMATICS AND STATISTICS

TEST 2 **MATHEMATICS 1000-004** November 20th, 2025

Name	**MUN Number**

[8] 1. Use the limit definition of the derivative to differentiate $f(x) = \sqrt{6x + 7}$.

[4] 2. Identify a function $f(x)$ that is continuous at the point $x = 0$ but is not differentiable at $x = 0$, and indicate why it has this property. You may either give an expression for $f(x)$ or sketch a representative graph for such a function.

[19] 3. Use appropriate differentiation rules (but not the limit definition) to find the derivative of each of the following functions. Make any obvious simplifications.

(a) $y = \dfrac{1 - e^{2x}}{1 + e^{2x}}$

(b) $y = x \tan(x) \sec(x)$

(c) $y = \sin^3\left(\frac{1}{x}\right)$

(d) $y = \ln\left(\dfrac{x^7 e^x}{\cot^2(x)\sqrt{x^4+1}}\right)$

[9] 4. Consider the curve defined by the implicit function

$$\sin(x) + 4\cos(y) = x^2 y.$$

(a) Use implicit differentiation to determine $\dfrac{dy}{dx}$.

(b) Find the equation of the tangent line to the curve at the point $(0, \frac{\pi}{2})$.