MEMORIAL UNIVERSITY OF NEWFOUNDLAND

DEPARTMENT OF MATHEMATICS AND STATISTICS

TEST 2 **MATHEMATICS 1000-006** NOVEMBER 12TH, 2024

Name	**MUN Number**

[11] 1. Find the derivative of $f(x) = \dfrac{x^2}{3x+1}$ in two ways.

(a) Using the limit definition of the derivative.

(b) Using the Quotient Rule.

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

(a) $y = \sqrt{x}\sec(\sin(x))$

(b) $y = \cot^5(3x)$

(c) $y = \cos(x^7 e^x)$

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

$$xy^4 + 9 = x^2 + 3y.$$

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

(b) Find the equation of the tangent line to the curve at the point $(3, 1)$.

[5] 4. Use the <u>limit definition</u> of the derivative to prove the Constant Multiple Rule:

$$[kf(x)]' = kf'(x) \qquad \text{for any constant } k.$$

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[40]