

MEMORIAL UNIVERSITY OF NEWFOUNDLAND

DEPARTMENT OF MATHEMATICS AND STATISTICS

ASSIGNMENT 5

MATHEMATICS 1001

WINTER 2025

Due: Monday, March 10th, 2025 at 11:59pm. See the Gradescope Handout for submission information.

Note: You should complete the WeBWorK problem sets “The Fundamental Theorem of Calculus I”, “The Fundamental Theorem of Calculus II”, and “Definite Integrals by u -Substitution”, as well as Worksheet 2.3, before you work on this assignment.

1. Use the First Fundamental Theorem of Calculus to find $f'(x)$, given

$$f(x) = \int_x^{5x} \sqrt{1+t^4} dt.$$

2. Use the Second Fundamental Theorem of Calculus to evaluate each of the following definite integrals.

(a) $\int_{\frac{\pi}{6}}^{\frac{\pi}{4}} \sin^3(\theta) \cos(\theta) d\theta$

(b) $\int_1^e \frac{\ln(x)}{x^3} dx$

(c) $\int_{-5}^5 |x+2| dx$

3. Use the Fundamental Theorem of Calculus to find the area of the region which lies under the curve $f(x) = \frac{1}{x^2 + 25}$ and between the lines $x = 0$ and $x = 5$.