

## Mathematics 1121H – Calculus II

TRENT UNIVERSITY, Winter 2026

### Assignment #2

Due on Friday, 23 January.\*

Please read the handout *Right-Hand Rule Riemann Sums* and Section 8.6 of the textbook before tackling this assignment. The subtext to this assignment is to practice things that you should have learned in MATH 1110H/1111H, not counting the Trapezoid and Simpson's Rules.

In all that follows, let  $f(x) = xe^{-x}$ .

1. Compute  $\int_{-1}^3 f(x) dx$  by hand, showing all the principal steps. [2]

NOTE. In questions **2–5**, please give decimal approximations to at least 4 decimal places as your answers.

2. Compute  $\int_{-1}^3 f(x) dx$  using SageMath. [2]
3. Use SageMath to compute the Right-Hand Rule sum for  $\int_{-1}^3 f(x) dx$  for a partition of  $[-1, 3]$  into **a.** 4, **b.** 16, and **c.** 64 equal pieces, respectively.  $[1.5 = 3 \times 0.5 \text{ each}]$
4. Use SageMath to compute the Trapezoid Rule sum for  $\int_{-1}^3 f(x) dx$  for a partition of  $[-1, 3]$  into **a.** 4, **b.** 16, and **c.** 64 equal pieces, respectively.  $[1.5 = 3 \times 0.5 \text{ each}]$
5. Use SageMath to compute the Simpson's Rule sum for  $\int_{-1}^3 f(x) dx$  for a partition of  $[-1, 3]$  into **a.** 4, **b.** 16, and **c.** 64 equal pieces, respectively.  $[1.5 = 3 \times 0.5 \text{ each}]$
6. Find a numerical approximation algorithm or formula for definite integrals besides the three mentioned on this assignment and give a reference to it. [1.5]

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\* You should submit your solutions via Blackboard's Assignments module, preferably as a single pdf. If submission via Blackboard fails, please submit your work to your instructor by email or on paper as soon as you can. You may work together, look things up, and use whatever tools you like, so long as you *write up your submission by yourself* and give due credit to your collaborators and any sources and tools you actually used.