

MEMORIAL UNIVERSITY OF NEWFOUNDLAND
DEPARTMENT OF MATHEMATICS AND STATISTICS

SECTION 2.1

Math 1001 Worksheet

FALL 2025

For practice only. Not to be submitted.

1. Write each of the following sums using sigma notation (with $i = 1$ as the lower bound of summation).

(a) $\frac{2}{5} + \frac{4}{10} + \frac{8}{15} + \frac{16}{20} + \cdots + \frac{2^n}{5n}$

(b) $y^2 + 8y^2 + 27y^2 + 64y^2 + \cdots + n^3y^2$

2. Use the summation formulas to evaluate each of the following sums.

(a) $\sum_{i=1}^n (4i + 3)$

(b) $\sum_{i=1}^n (i^3 - 6i)$

(c) $\sum_{i=1}^n (3i + 1)^2$

3. Consider the region R which lies between the graph of $f(x) = 2 - x$ and the x -axis, on the interval $[-1, 1]$.

- (a) Determine the width Δx of each subinterval in a regular partition of $[-1, 1]$.
- (b) Give an expression for the right endpoint x_i of the i th subinterval. Use this to find formulas for the point m_i and M_i at which $f(x)$ attains its minimum and maximum values on the i th subinterval.
- (c) Determine $f(m_i)$ and $f(M_i)$.
- (d) Find formulas for the lower sum $s(n)$ and the upper sum $S(n)$.
- (e) Estimate the area A of the region R by finding the lower and upper sums with $n = 5$ subintervals. Give your answers to one decimal place.
- (f) Estimate the area A of the region R by finding the lower and upper sums with $n = 500$ subintervals. Give your answers to two decimal places.
- (g) Find the true value of A by taking the limit of the formulas you derived in part (d) as $n \rightarrow \infty$, and showing that these limits are equal.

4. Use the limit of a Riemann sum to determine the area A of the region which lies below the curve $f(x) = 3 + 3x - x^2$, above the x -axis, to the left of $x = -1$ and to the right of $x = 3$.