

CS113/DISCRETE MATHEMATICS-SPRING 2024

Worksheet 13

Topic: Sequence Summation

Today, we will learn to calculate the sum of terms in a sequence and derive summation formulas. Get ready to unlock the power of summation and discover the beauty of sequence formulas! Happy Learning!

Student's Name and ID: _____

Instructor's name: _____

1 Table 1

Summation	Closed Form
$\sum_{k=0}^n ar^k \quad (r \neq 0)$	$\frac{ar^{n+1} - a}{r - 1}, \quad (r \neq 1)$
$\sum_{k=1}^n k$	$\frac{n(n+1)}{2}$
$\sum_{k=1}^n k^2$	$\frac{n(n+1)(2n+1)}{6}$
$\sum_{k=1}^n k^3$	$\frac{n^2(n+1)^2}{4}$
$\sum_{k=0}^{\infty} x^k, \quad x < 1$	$\frac{1}{1-x}$
$\sum_{k=1}^{\infty} kx^{k-1}, \quad x < 1$	$\frac{1}{(1-x)^2}$

1. Show that

$$\sum_{j=1}^n (a_j - a_{j-1}) = a_n - a_0$$

2. Derive the formula for $\sum_{k=1}^n k^2$ given in Table 1.

3. Find following using table1:

(a) $\sum_{k=100}^{200} k$

(b) $\sum_{k=10}^{20} (k-1)(2k^2+1)$

$$(c) \sum_{k=10}^{20} k^2(k-3)$$