

# CS113/DISCRETE MATHEMATICS-SPRING 2024

## Worksheet 12

Topic: Sequences and recurrence relation

Today, we will learn about recurrence relations, their proofs, and converting between recurrence formulas and general forms. Happy Learning!

Student's Name and ID: \_\_\_\_\_

Instructor's name: \_\_\_\_\_

1. Show that the sequence  $a_n$  is a solution of the recurrence relation  $a_n = -3a_{n-1} + 4a_{n-2}$  if:  
(a)  $a_n = 0$

(b)  $a_n = -4^n$

2. For each of these lists of integers, provide a simple formula or rule that generates the terms of an integer sequence that begins with the given list. Assuming that your formula or rule is correct, determine the next three terms of the sequence

(a) 3, 6, 11, 18, 27, 38, 51, 66, 83, 102,...

(b) 7, 11, 15, 19, 23, 27, 31, 35, 39, 43

(c) 1, 10, 11, 100, 101, 110, 111, 1000, 1001, 1010, 1011,...

(d) 2, 4, 16, 256, 65536, 4294967296,...

3. Prove that the closed-form solution of the recurrence relation  $a(n) = 2a(n-1) + 3^n$  for  $n \geq 1$  is  $a(n) = 2^n + (n+1) \cdot 3^n - (n+2)$ .