**Assignment 1 – Due Dec 4, 2022**

**Instructions: This is a group project. However, each member in the group should indicate what question they will be the lead on. The grade of the lead will comprise 50% of the question he/she leads and 10% each from the other question. The 10% will be scored based on the reported contribution from the other leads.**

**Clarifications.**

1. **Only one submission per group on blackboard. List the names of the group members in the submission and for each question, the name of the student who is the lead should be indicated.**
2. **All students should submit an individual assessment of other member contribution on blackboard.**

**Question 1:**

a) Find all solutions of the recurrence relation an = −5an−1 − 6an−2 + 42. 4n.

b) Find the solution of this recurrence relation with a1 = 56 and a2 = 278.

**Question 2:**

Suppose that there are two goats on an island initially. The number of goats on the island doubles every year by natural reproduction, and some goats are either added or removed each year.

a) Construct a recurrence relation for the number of goats on the island at the start of the nth year, assuming that during each year an extra 100 goats are put on the island.

b) Solve the recurrence relation from part (a) to find the number of goats on the island at the start of the nth year.

**Question 3:**

Let A = {x,y,z}. Specify a binary relation R on A such that R is not reflexive,

but *R ο R* (composite) is reflexive. You should explain for your example why R is not reflexive but *R ο R* is.

**Question 4:**

Let A = {a, b, c, d}. How many binary relations over A are symmetric but not reflexive? For instance, {(a, a), (b, c), (c, b)} is symmetric, but not reflexive.

**Question 5:**

Let X = {1, 2, 3, 4, 5}. Consider the binary relation R on X defined by

R = {(1, 2), (2, 3), (3, 1), (3, 4), (4, 5), (5, 4)}

Find the transitive closure of R.

**Question 6:**

Let G be an undirected graph with a loop at every vertex. Show that the relation R on the set of vertices of G such that uRv if and only if there is an edge associated to {u, v} is a symmetric, reflexive relation on G.