CS 200 Algorithms and Data Structures
Written Assignment #4
Due on Apr. 13 at the beginning of the class

[Problem 1] 5pts
List the 16 different relations on the set {0,1}.

[Problem 2] 5 pts (2+2+2+2+2)
For each of these relations on the set {1,2,3,4}, decide whether it is reflexive, whether it is symmetric, whether it is antisymmetric, and whether it is transitive.

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

[Problem 3] 5 pts (1+1+1+2)
Let R be the relation on the set {1,2,3,4} containing the ordered pairs (1,1), (1,2), (1,3), (2,3), and (2,4). Find
(1) R^2
(2) R^3
(3) R^4
(4) R^5

[Problem 4] 5 pts
Let R be a reflexive relation. Show that R^n is reflexive for all positive integers *n.*
(Hint: use mathematical induction on *n*)

[Problem 5] 5 pts (2+1+1+1)
Represent each of these relations on {1,2,3,4} with a **matrix**
(1) {(1,2),(1,3),(1,4),(2,3),(2,4),(3,4)}
(2) {(1,1),(1,4),(2,2),(3,3),(4,1)}
(3) {(1,2),(1,3),(1,4),(2,1),(2,3),(2,4),(3,1),(3,2),(3,4),(4,1),(4,2),(4,3)}
(4) {(2,4),(3,1),(3,2),(3,4)}

[Problem 6] 5 pts (1+1+1+1+1)
How many ***nonzero entries*** does the matrix representing the relation R on A = {1,2,3,4…,10} consisting of the first 10 positive integers have in R is
(1) {(a,b)|a ≤ b}?
(2) {(a,b)|a = b±1}?
(3){(a,b)|a+b = 10}?
(4){(a,b)|a+b ≤ 10}?
(5){(a,b)|a ≠ 0}?