MAT 115: Finite Math for Computer Science
Problem Set 4

Out: 10/26/16 Due: 11/02/2016

Instructions:
I leave plenty of space on each page for your computation. If you need more sheet, please attach your work right behind the corresponding problem. If your answer is incorrect but you show the computation process, then partial credits will be given. Please staple your solution and use the space wisely.

First Name:

Last Name:

Score: /60

Problem 1   Power set: $5 + 5 + 5$ pts

Given a set $A = \{a, c, d, t\}, B = \{g, k, i\}$, please compute the following:
(a) A^2

(b) $B^2 \times A$

(c) Power set of A

Problem 2   Power set : 5 + 5 pts

Compare the following paris of sets. Can they be equal? Is one a subset of the other? Can they have the same size?

(a) $\mathcal{P}(A \cup B)$ and $\mathcal{P}(A) \cup \mathcal{P}(B)$

(b) $\mathcal{P}(A \times B)$ and $\mathcal{P}(A) \times \mathcal{P}(B)$

Problem 3   Combinatorial: 10 pts

Please show that $C(n, k) = C(n - 1, k - 1) + C(n - 1, k - 1)$

Problem 4   Permutation and Cycles: 5 + 5 pts

A permutation is given in online-line, two-line or cycle form. Convert it to the other two
forms. Give its inverse in all three forms.
(1) $(1,3,7,8)(2,5)(4)(6)$

(2) $\begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 \\ 8 & 3 & 7 & 2 & 6 & 4 & 5 & 1 \end{pmatrix}$

Problem 5   Permutation Application: 5 + 5 + 5 pts

Your friend tries to see if you are fast enough to catch him. He takes out four cups. He places a pea under the first cup. He quickly interchanges the cups in the second and third positions then the cups in the first and third positions and then the cups in the second and third positions. Finally he interchanges the second and fourth cup. The entire set of interchanges is done a total of five times.

(a) Write one entire set of interchanges as a permutation in cycle form:

(b) Write one entire set of interchanges as a permutation in adjacency matrix form:

(c) Where is the pea?