MAT 115: Finite Math for Computer Science
Problem Set 5

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

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: **/75**

Problem 1 Relation & Partition: 10 + 5 + 5 pts

Let $A = \{1, 2, 3, 4\}$ and $R = \{(1, 1), (2, 2), (3, 3), (4, 4), (1, 4), (4, 1), (2, 3), (3, 2)\}$.
(a) Is R an equivalence relation? (need to verify those three properties)

(b) What are the equivalent classes (partitions) of A

(c) $A = \{1, 2, 3, 4, 5, 6\}$ and it can be partitioned by R_2 such that the partitions are $P_1 = \{1, 5\}, P_2 = \{2, 4, 6\}$ and $P_3 = \{3\}$. Please write out the relation R_2.

Problem 2 Permutation: the length of the cycle 10pts

All the permutations given below are in cycle form.
(a) $f : 3^{\{1,2,3\}}$ and $f = (2, 1, 3)$. Please compute $(1, 2, 3)^{300}$

(b) $f : 3^{\{1,2,3,4,5\}}$ and $f = (3, 5, 1, 2, 4)$. Please compute $((1, 3), (2, 5, 4))^{300}$

Problem 3 Application: Permutation 10pts

Please search on the internet and simply describe an application of permutation in computer science.

Problem 4 Relation: Equivalence 10pts

Define integers $x \equiv y$ to be related if $d|(x-y)$. Show that $\equiv$ is an equivalence relation by defining a function M that xMy when $d|(x-y)$.

Reflexive:

Symmetric:

Transitive:

Problem 5 Functions: (5 + 5 + 10 + 5)

(a) $f \in 5^{\{+,-,*,@\}}, f = (1, 2, 3, 3)$

(a-1) 2-line form

(a-2) Injective or Surjective or Bijective or None? Why?

(b) Let fucntion f be defined as $f : A \to B$ where $A, B.$ are sets of intergers.
(b-1) Please show that if f is injective, then $|A| \leq |B|$

(b-2) Let $A = \{1, 2, 3, 4\}$ and $B = \{5, 6, 7, 9, 8\}$. Please draw a mapping to rebutt the statement that if $|A| \leq |B|$ then f is injective.