Discrete Mathematics and Applications

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1 Assignment No. 3: sets and functions

Due: Wednesday, Sep. 29

Please submit your answer in a neat, readable properly organized format.

1. .Draw the Venn diagram for each of these combinations of four sets:
   a. $(A \cap B) \cup (C \cap D)$
   b. $A - (B \cap C \cap D)$
   c. $(\overline{A} \cup \overline{B}) \cap (\overline{C} \cup \overline{D})$

2. Let $A_i = \{x | 1 \leq x \leq i, \; x, i \in N\}$
   a. Find $\cup_{i=1}^{n} A_i$.
   b. Find $\cap_{i=k}^{2k} A_i$

3. We have 26 students in our class. How many teams can be formed if:
   a. Each team must have an odd number of students. b. Every tean must include at least 3 students. c. Every two teams must have an odd number of students in common.

4. How many teams can we have if no team is a subset of another team.

5. Can you find an integer n such that $n^2 \bmod 11 = 5$, $n^3 \bmod 17 = 10$, $and \, n \bmod 23 = 14$

2 Functions exercises

1. In the enumeration used in class for NxN in what location will be the pair $(45, 32)$.
   What pair will be in location 2010?

2. a. If $f \; and \; f \circ g$ are ONTO does it follow that g is ONTO?
   b. If $f \; and \; f \circ g$ are $1 - 1$ does it follow that g is $1 - 1$?

3. Show that the function $f : Z^+ \times Z^+ \to Z^+$ defined by: $\frac{(m+n-2)(m+n-1)}{2} + m$ is a bijection.