Assignment #3

Sets and Set Proofs

Due Date: Sunday, September 20th 2015, 11:59pm

Please include your NID and full name in your submitted PDF

Objectives

1. To give students practice understanding sets.
2. To give students practice with set proofs.

Problem 1

Let $A = \{4, \{4\}, \{2\}\}$. Indicate whether each of the following statements is true or false.

a) $1 \in A$
b) $1 \notin A$
c) $4 \in A$
d) $\{2\} \in A$
e) $\{2\} \subseteq A$
f) $\{\{4\}\} \subseteq A$
g) $\{4\} \in A$
h) $\{4\} \subseteq A$
i) $\{\{2\}\} \subseteq A$
j) $\{\{2\}\} \subset A$

Problem 2

For arbitrary finite sets A, B, and C from some universe of discourse. Prove or disprove the following:

a) If $A \subseteq B$ and $B \nsubseteq C$, then $A \nsubseteq C$
b) $A - B = \overline{B - A}$
c) $(A \cap B \cap C) \subseteq (A \cap B)$
d) $A \subseteq B \wedge A \subseteq C \Rightarrow B \cap C \neq \emptyset$
e) $(A \cup B) \subseteq A$
f) $\big((A \cap C) = (B \cap C)\big) \Rightarrow (A = B)$
g) $A \cup (B - A) = (A \cup B)$
h) $(A \subseteq B) \Leftrightarrow (\overline{B} \subseteq \overline{A})$
i) $\big(A \subseteq (B - C)\big) \Rightarrow (A \cap C = \emptyset)$
j) $(A - C = B - C) \Rightarrow (A = B)$
k) $A \subseteq B \wedge A \subseteq C \Rightarrow A = \emptyset \vee (B \cap C \neq \emptyset)$

Note: You may not use set membership tables or Venn diagrams for any of the proofs.

Problem 3

Find the sets A and B if $A - B = \{1, 5, 7, 8\}$, $B - A = \{2, 10\}$, and $A \cap B = \{3, 6, 9\}$.

Problem 4

Let $S = \{1, 2, 6, 9\}$. Using the roster method, write the following:

a) $\wp(S)$
b) $S \times S$

Note: $\wp(S)$ denotes the power set of S.

Problem 5

Write, using set builder notation, the following sets:

a) The set containing all positive powers of 2, (i.e. $\{1, 2, 4, 8, 16, \ldots\}$)
b) The set containing all odd integers, (i.e. $\{\ldots, -3, -1, 1, 3, 5, \ldots\}$)
c) The set containing all multiples of 4 greater than 42, (i.e. $\{44, 48, 52, 56, 60, \ldots\}$)