

CS 313k - homework 5

Staple the pages of your solution set together, and put your name and EID on the top of the first page. Answer each question clearly. The logic you use to produce your answers is the most important thing.

1. For any sets A , B and C , show that $A \cup (B - A) \subseteq A \cup B$.
2. For any sets A , B and C , show that $(A \cap B \cap C)^c = A^c \cup B^c \cup C^c$. Do this proof in two ways:
 - (a) Using set identities
 - (b) By showing each set is a subset of the other set.
3. What can you say about the sets A and B and the relationship between the two sets if the following statement holds? Name the minimum restrictions on A and B that force the statement to hold.
 - (a) $A \cup B = A$?
 - (b) $A - B = B - A$?
 - (c) $A - B = A$?
 - (d) $A \subseteq A \cup B$?
4. For each of the following, define the 4 sets $\bigcup_{i=1}^n A_i$, $\bigcap_{i=1}^n A_i$, $\bigcup_{i=1}^{\infty} A_i$, $\bigcap_{i=1}^{\infty} A_i$.
 - (a) $A_i = \{0, i\}$ for all i .
 - (b) $A_i = \{\dots, -3, -2, -1, 0, 1, 2, \dots, i\}$ for all i .
5. Let $U = \{a, b, c, d, e, f\}$, and let $A = \{a, e, f\}$ and $B = \{a, c\}$. Give the bit representations for the following sets.
 - (a) A
 - (b) B
 - (c) $A \cup B$
 - (d) $A \cap B$
 - (e) $A - B$
6. For a finite domain U and sets A and B , define the bit string representation for $A - B$.
7. Prove that $A \times \emptyset = \emptyset$ for any set A .
8. Let $A = \{a, b, c\}$, $B = \{cat, dog\}$, $C = \{1, 2\}$. What is $A \times B \times C$? What is $B \times B \times A$?

9. Write down the “less than” relation on the set $\{1, 2, 3, 4\}$.
10. Consider the \subseteq relation on the set of subsets of $\{a, b\}$:
- (a) Write down this relation.
 - (b) Is the relation reflexive? Prove your answer.