

FINITE MATH: QUIZ 1 SOLUTION

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Problem 1. Suppose the universal set is $U = \{1, 2, 3, \dots, 10\}$. Consider the sets

$$A = \{1, 2, 3, 4\}, \quad B = \{3, 4, 5, 6, 7\}, \quad C = \{2, 3, 8, 9\}, \quad \text{and} \quad D = \{3, 7, 9, 10\}.$$

- a) (1 pt) List the elements of the set $A \cup C$.

The union combines the two sets into one. So $A \cup C = \{1, 2, 3, 4, 8, 9\}$. Notice that even though elements 2 and 3 appear in both sets, we only write them once in the union.

- b) (1 pt) List (if any) the elements of the set $A \cap B$, or state if it is empty.

The intersection gives only the elements that A and B have in common. These are elements 3 and 4, so $A \cap B = \{3, 4\}$.

- c) (1 pt) What are the elements of the set B' ?

The complement of B contains all the elements from the universe U which are NOT in B . These are $B' = \{1, 2, 8, 9, 10\}$.

- d) (1 pt) List the elements of the set $B \cup B'$.

When we take the union of a set and its complement, this gives us everything in the universe. In other words, $B \cup B' = U = \{1, 2, 3, \dots, 10\}$.

- e) (1 pt) List (if any) the elements of the set $B \cap B'$, or state if it is empty.

When we take the intersection of a set and its complement, we are looking at what elements the two sets have in common. But since B' contains only those elements that are NOT in B , the sets B and B' have nothing in common. In other words, $B \cap B' = \emptyset$, the empty set.

- f) (1 pt) List (if any) the elements of the set $A \cap B \cap C \cap D$, or state if it is empty.

The intersection gives the elements common to all four sets. The only such element is 3, so $A \cap B \cap C \cap D = \{3\}$.

- g) (1 pt) Find $B \setminus D$.

We need to find the elements of B which are NOT in D . Then $B \setminus D = \{4, 5, 6\}$. We had to remove element 3 from B since that element appeared in D .

Problem 2. (1 pt) Is it true that any set S is **disjoint** from its complement S' ? Circle one.

YES

NO

Problem 3. (1 pts) List (if any) the elements of the set $\{x \mid x^2 = -1\}$, or state if it is empty. Explain.

We need to find the solution set of the equation $x^2 = -1$, i.e. all real values of x that satisfy that equation. We know from algebra that squaring a real number ALWAYS gives a non-negative answer. In other words, no matter what we plug in for x , the value of x^2 can never be negative. So we don't have any solutions. The set described is $\boxed{\{ \} = \emptyset}$, the empty set.