Facts About Sets

Let A, B, and C be subsets of a universal set U. Then

1. $\overline{A} = U - A$.
2. $\overline{\overline{A}} = A$.
3. $A \cup \overline{A} = U$, $A \cap \overline{A} = \phi$.
4. $A \cap U = A$, $A \cup U = U$.
5. not$(x \in A)$ is equivalent to $x \in \overline{A}$.
6. $\overline{\phi} = U$, $\overline{U} = \phi$.
7. If $A \subseteq B$, then $\overline{B} \subseteq \overline{A}$.
8. $A - B = A \cap \overline{B}$.
9. $\overline{A \cap B} = \overline{A} \cup \overline{B}$, $\overline{A \cup B} = \overline{A} \cap \overline{B}$.
10. $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$, $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$.
11. $A \cap (B \cap C) = (A \cap B) \cap C$, $A \cup (B \cup C) = (A \cup B) \cup C$.
12. $A \cup B = B \cup A$, $A \cap B = B \cap A$.
13. $A \cap B \subseteq A$, $A \cap B \subseteq B$, $A \subseteq A \cup B$, $B \subseteq A \cup B$.
14. $A - B$ is not necessarily equal to $B - A$.
15. $A \times B$ is not necessarily equal to $B \times A$.
16. $A \cup \phi = A$, $A \cap \phi = \phi$, $\phi \subseteq A$.

Questions

Prove or disprove.

1. If p is a prime number greater than 2, then p is an odd natural number.
2. If a and b are irrational numbers such that $a \neq -b$, then $a + b$ is irrational.
3. Every prime number is odd.
4. The set $A = \{m | m = 1 + 10n, n \in \mathbb{N}\}$ is a proper subset of the set $B = \{m | m = 1 + 5n, n \in \mathbb{N}\}$.
5. If A and B are any sets such that $A \subseteq B$, then $\overline{A} \subseteq \overline{B}$.
6. If A, B, and C are any sets, then $A \cap (B \cup C) = (A \cap B) \cup C$.
7. If A, B, and C are any sets, then $A \cup (B \cap C) = (A \cup B) \cap C$.
8. IF A and B are any sets such that $A \subseteq B$, then $A \cup C \subseteq B \cup C$, for any set C.
9. IF A and B are any sets such that $A \subseteq B$, then $B \cap C \subseteq A \cap C$, for any set C.