**CS U200 Discrete Structures** **Fall 2003**

**Written Homework 3** **Due: October 24, 2003 at the start of class**

1.

Theorem: $\overline{A \cap B \cap C} = \overline{A} \cup \overline{B} \cup \overline{C}$.

Proof:

$$x \in \overline{A \cap B \cap C} \equiv x \notin A \cap B \cap C$$
$$\equiv x \notin A \vee x \notin B \vee x \notin C$$
$$\equiv x \in \overline{A} \vee x \in \overline{B} \vee x \in \overline{C}$$
$$\equiv x \in \overline{A} \cup \overline{B} \cup \overline{C}$$

*Q.E.D.*

In this style, prove:

Theorem: $(B - A) \cup (C - A) = (B \cup C) - A$.

2. a. Prove: $(A \cup B) - B \subseteq A$ .

   b. Give an example of two sets $A$ and $B$ such that $(A \cup B) - B \neq A$ .

3. Prove that if n is an odd integer then $n^3$ is an odd integer.

4. Prove that if a, b, and m are integers such that m >= 2 and a ≡ b (mod m), then gcd(a, m) = gcd(b, m).