Test Three

This fluffy and fun fifty-minute test covers chapter three of Ethan Bloch's *Proofs and Fundamentals*. All parts of problems are five points unless otherwise stated.

1. Circle T for (always) true or F for (at least once) false. (one point each)

T F Every set is a power set.
T F There is a set that is an element of every set.
T F Every set is a proper subset of itself.
T F Every set is a subset of at least one set.
T F The power set $\wp(A)$ of the set $A=\{1,2,3,4\}$ has more than 314 elements.
T F The power set $\wp(A)$ of the set $A=\{1,2,3,4\}$ has more than 314 subsets.
T F I enjoy proving theorems on the board.
T F For all sets $A \cup B \subseteq A \cap B$.
T F For all sets A, $\emptyset \in A$.
T F For all sets A, $\{\emptyset\} \subseteq A$.

2. Let A = {2}, B=(0,5), C=[1,6]. Find the following. (3 points each)

a. $\wp(\wp(\emptyset))$

b. $B - (C - A)$

c. $(A \cap B) \cup C$

Prove the following: (A, B and C are sets in all theorems.)

3. **Theorem**. If $A \subseteq B$ and $B \subseteq C$, then $A \subseteq C$

4. **Theorem**. If $A \cup B = A \cap B$, then $A \subseteq B$.

5. **Theorem**. If $A \subseteq B$, then $A \times C \subseteq B \times C$

6. **Theorem.** $\wp(A \cap B) \subseteq \wp(A \cup B)$

7. **Theorem.** $A \cap (B \cup C) \subseteq (A \cap B) \cup (A \cap C)$