Math 242, Fall 2010. Name ____________________________
Proof, Chapter 4, sets. initial each sheet you use

1. (5 pts) Define *intersection* ($\cap$) in sentence-form.

2. (28 pts) True or false? [If true, just say so. However, if it is false, give a counterexample.]
a) T F 7 is an upper bound of the empty set.

b) T F If $x < k$ for all x in S, then $\sup(S) < k$.

c) T F $\sup(S \cup T) \le \sup(S) + \sup(T)$.

d) T F $S \cup T \in \boldsymbol{P}(S) \cup \boldsymbol{P}(T)$. [$\boldsymbol{P}$ denotes the power set.]

Read These Instructions! If it was done in the text, in class, or on the homework, **do it again here**. To prove something, do not use something very similar or more sophisticated. You are responsible for knowing what is prior. For the next proofs, true assertions without immediate connections to prior results will not receive full credit. True statements that rely on two or more reasons at once will not receive full credit. Make steps with simple one-step justifications, and mention the justifications.

3. (10 pts) Prove: If $S \cup T$ is bounded above, then S is bounded above.

[Do these on separate paper provided.]

4. (12 pts) Prove: If $\boldsymbol{P}(S) \subset \boldsymbol{P}(T)$, then $S \subset T$.

5. (15 pts) Conjecture: If $S \subset T$, then $\sup(S) \le \sup(T)$.

6. (15 pts) Conjecture: If, for all $\varepsilon > 0$, $d \ge c - \varepsilon$, then $d \ge c$.

7. (15 pts) Given S, define $R = \{y \mid y = x^2 \text{ and } x \in S\}$. Prove: $\sup(R) \ge (\sup(S))^2$ [for the case when $\sup(S)$ is finite.]