CS 381 **Introduction to Theory of Computing** Summer 2002
Quiz 2 June 3, 2002

Write your name here: _____

1. Let $A \subset \Sigma^*$ be a nonempty regular set and $z \in A$ a fixed string. Prove that

$$\{x \in \Sigma^* \mid \text{either } x \in A \text{ or } x = z^n \text{ for some integer } n \geq 0\}.$$

is a regular set. You may use the fact that $B = \{z\}$ is a regular set without proving it.

2. Show that the following set is not regular:

$$A = \{a^n b^m \mid m \geq n\}.$$

You may use the property $(\neg P)$: For all $k \geq 0$, there exist strings x, y, z such that $xyz \in A$, $|y| \geq k$, and for all u, v, w with $y = uvw$ and $v \neq \epsilon$, there exists an $i \geq 0$ such that $xuv^iwz \notin A$.

3. Let $A = \{a^n b^n \mid n \geq 0\}$. True or false: For every $B \subseteq \{a, b\}^*$ with $A \subseteq B$, B is not regular.