Solutions for Quiz #3 September 9, 2003

1. { 6 points } **Rewrite the statements formally using quantifiers and variables, and write a negation for the statement.**

(A) Somebody trusts everybody.

formally: $\exists$ a person X : $\forall$ people Y, X trusts Y.

negation: $\forall$ people X, $\exists$ a person Y : X does not trust Y.

also: Everybody does not trust somebody.

(B) If a real number is greater than 3, then its square is greater than 9.

formally: $\forall$ real numbers x, if $x > 3$ then $x^2 > 9$.

negation: $\exists$ a real number x : $x > 3$ and $x^2 \leq 9$.

also: $\exists$ a real number x : $x > 3$ and it is not true that $x^2 > 9$.

or There is a real number which is greater than 3 and its square is not greater than 9.

2. { 2 points } **State whether the following argument is valid by universal modus ponens or universal modus tollens, or is invalid and exhibits the converse or the inverse error.**

All honest people pay their taxes.
Darth is not honest.
$\therefore$ Darth does not pay his taxes.

☐ The argument is valid. ✓ *The argument is not valid.*

Justify your answer: Converse error.

3. { 2 points } **Indicate whether the following argument is valid or invalid.**

All teachers occasionally make mistakes.
No gods ever make mistakes.
$\therefore$ No teachers are gods.

✓ *The argument is valid.* ☐ The argument is not valid.

Support your answer by drawing diagrams: