1. For each of the following statements:

- write the negation of the statement;

- determine whether the original statement is true, or if the negation is true, for each of the following sets S: positive real numbers; integers; rational numbers. For this part, explain how you know your answer is correct.

 (a) $(\forall x \in S)(\exists y \in S)(x + y = 0)$

 (b) $(\exists a \in S)(\forall b \in S)(ab = 0)$

2. Let a, b, c be positive integers. Prove that if $a \mid a + b$ and $b \mid b + c$, then $a \mid a + c$.