

1. PROVING EQUIVALENCE

Suppose P , Q , R , and S are statements.

- (1) Prove that $P \Rightarrow (Q \Rightarrow (R \Rightarrow S))$ is equivalent to $(P \wedge Q \wedge R) \Rightarrow S$.
- (2) Prove that $((P \Rightarrow Q) \Rightarrow R) \Rightarrow S$ is equivalent to $(\neg P \wedge \neg R) \vee (Q \wedge \neg R) \vee S$.

2. NEGATION

Negate the following sentences:

- (1) Every dog has its day, or perhaps its cat.
- (2) $\forall x \in X, \exists y \in Y, x > y \wedge y > x$

3. GUARANTEES

Consider the statement:

(S1) A and B are both guarantees that C is true.

- (1) Write (S1) symbolically. Use parentheses “(” and “)” to make your answer precise.
- (2) Choose some appropriate phrases to replace A, B and C. Use these to write (S1) in English. Does this cause you to reconsider your answer to (1)?
- (3) Suppose (S1) is true and A is false. What, if anything, can be determined about B and C? Briefly justify.