

EE1001 Foundations of Digital Techniques

Assignment 3

Due: Sep 26 (before lecture begins)

1. Symbolize the following argument and draw the conclusion. For this question, one inference step is enough. State the rule that justifies it.
 - a) Either the universe has always existed or it has a supernatural cause.
 - b) The universe has not always existed.
2. Symbolize the following argument and draw the conclusion, stating the rule that justifies each step.
 - a) God is self-existent and is the creator of all other things.
 - b) If there are abstract objects like numbers, they are not created by God.
 - c) If numbers are not created by God, then God is not the creator of all other things.
3. Use the rules of inference to deduce the conclusion (i.e. $\sim q$) from the premises (i.e. lines 1 to 5), giving a reason for each step.
 - a) $\sim p \vee q \rightarrow r$
 - b) $s \vee \sim q$
 - c) $\sim t$
 - d) $p \rightarrow t$
 - e) $\sim p \wedge r \rightarrow \sim s$

Therefore, $\sim q$.

4. Write a negation for each of the following statements in English:
 - a) "All men are created equal." (This was used by Thomas Jefferson in the U.S. Declaration of Independence in 1776.)
 - b) "We are all in the gutter, but some of us are looking at the stars." (This is a famous quote by Oscar Wilde.)
5. Write a negation for the statement " $\forall x \in \mathbf{R}$, if $x > 3$, then $x^2 \geq 9$ ".
6. Is the following statement true? Why or why not?
"For all non-zero real number x , there exists a real number y such that $xy = 1$."
7. Are the following statements logically equivalent?
 $\forall x \in D, P(x) \vee Q(x)$ and $(\forall x \in D, P(x)) \vee (\forall x \in D, Q(x))$.