

1. (50%) Use the truth-tree method to determine whether the following formulas are valid or not.
 - (a) $p \vee q \rightarrow q \vee p$
 - (b) $((p \rightarrow q) \rightarrow s) \wedge (p \rightarrow (q \rightarrow s))$
 - (c) $p \vee (q \wedge r) \rightarrow (p \vee q) \wedge (p \vee r)$
 - (d) $\neg(\neg(\neg p \wedge \neg q) \wedge \neg p) \leftrightarrow \neg(q \vee \neg p)$
2. (50%) Symbolize the following sentences and determine whether they are valid or not.
 - (a) If the three rings have been correctly identified and the mace is indigenous, then the Ajo culture antedated the Tula if and only if the Tula culture was contemporary with or derivative from that of the present excavation.
 - (b) If it is the case that (if business will flourish on the condition that taxes will not increase, then the standard of living will improve) and (it is not the case that the standard of living will improve) and (if business does not flourish, then taxes will increase), then unemployment will be a problem.

Submit your solutions to Firat by the deadline. You may submit your trees as images, but, if you can, please convert your image files to pdf. For this homework, late submissions are not accepted. Please include your name in the name of the file. The homework should be an individual effort. Feel free to consult me or Firat, if you need further clarification about the homework. But, to avoid “spoilers”, please do NOT post your queries to the group.