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**Discrete Structure I****HW #1**

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1. Verify, without using a truth table, if  $\Gamma \models \varphi$  holds or not:
  - (a)  $\Gamma = \{p \rightarrow ((q \vee r) \rightarrow s), p \rightarrow q, q \rightarrow r\}$  and  $\varphi$  is  $p \rightarrow s$ .
  - (b)  $\Gamma = \{p \rightarrow q, q \rightarrow p, p \vee q, p \rightarrow \neg q\}$  and  $\varphi$  is  $\perp$ .
2. Prove that  $\models [(p \vee q) \wedge (\neg p \vee r)] \rightarrow (q \vee r)$  holds.
3. Prove that  $(p \rightarrow q) \rightarrow (r \rightarrow s)$  and  $(p \rightarrow r) \rightarrow (q \rightarrow s)$  are not logically equivalent.
4. Do Ex 8 and 10 page 17 in the book.