MAT 246, PS1 Solutions

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1. Use truth tables to determine whether the following statements are equivalent. In case they are not equivalent, determine an instance in which they differ (this would be a counter-example demonstrating the pairs are not equivalent.) One can try to include all cases in one or two truth tables to save space. The truth tables must be accompanied by some explanation, which could be minimal, describing what information to be extracted from the truth table, and how this information translates to results that you are suggesting.

   a) $\neg(p \Longrightarrow q)$ and $p \Longrightarrow \neg q$

   b) $\neg(p \Longrightarrow q)$ and $p \wedge \neg q$

   c) $\neg(p \Longrightarrow q)$ and $\neg p \Longrightarrow \neg q$

   d) $\neg(p \Longrightarrow q)$ and $\neg p \Longrightarrow q$

   e) $p \Longrightarrow q$ and $\neg(q \Longrightarrow p)$

   f) $p \Longrightarrow q$ and $q \vee \neg p$

   g) $p \Longrightarrow q$ and $\neg q \vee p$

   h) $p \Longrightarrow q$ and $\neg q \Longrightarrow \neg p$

Answer: Here is the truth table for all statements in this problem.