CSE 2500-01: Homework 3

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Spring 2025

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Coded in LaTeX

Instructions

- Make 1 PDF file and upload on the HuskyCT by the end of due date.

- Show all your work including your justifications.

Problems

1. Use the logical equivalences $p \to q \equiv\ \sim p \vee q$ and $p \leftrightarrow q \equiv (p \to q) \wedge (q \to p)$ to rewrite the following statement forms without using the symbol $\leftrightarrow$ or $\to$. (30 points)

(a) $(p\wedge \sim q) \to r$

(b) $(p \to r) \leftrightarrow (q \to r)$

(c) $(p \to (q \to r)) \leftrightarrow ((p \wedge q) \to r)$

2. Use truth tables to show that the following argument forms are valid or invalid. Indicate which columns represent the premises and which represent the conclusion, and critical row(s). Include an explanation why the form of argument are valid or invalid. (50 points)

(a) $p \to q$
   p
   $\therefore q$

(b) $p \to q$
   $\sim q$
   $\therefore \sim p$

(c) $p \to q$
   q
   $\therefore p$

(d) $p \to q$
   $\sim p$
   $\therefore \sim q$

(e) $p \to q$
   $q \to r$
   $\therefore p \to r$

3. A set of premises and a conclusion are given as follows. Use the valid argument forms listed in Table 2.3.1 to deduce the conclusion from the premises, giving a reason for each step. Assume all variables are statement variables. (20 points)

- $(\sim p \vee q) \rightarrow r$

- $s \vee \sim q$

- $\sim x$

- $p \rightarrow x$

- $(\sim p \wedge r) \rightarrow \sim s$

- Conclusion: $\therefore \sim q$