

CSE 2500-01: Homework 3

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Coded in L^AT_EX

Problems

Question 1.

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

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

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

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

Question 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) $p \rightarrow q$
 p
 $\therefore q$

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

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

$$\begin{array}{l} \text{(d) } p \rightarrow q \\ \quad \sim p \\ \quad \therefore \sim q \end{array}$$

$$\begin{array}{l} \text{(e) } p \rightarrow q \\ \quad q \rightarrow r \\ \quad \therefore p \rightarrow r \end{array}$$

Question 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)

- $(\sim p \vee q) \rightarrow r$
 $s \vee \sim q$
 $\sim x$
 $p \rightarrow x$
 $(\sim p \wedge r) \rightarrow \sim s$
 $\therefore \sim q$