

CSci 1302 Assignment 3

Due Fri., Feb. 11 in class

Problem 1 (9 points). Prove the following equivalences:

1. $(p \rightarrow q) \wedge (p \rightarrow r) \wedge p \equiv p \wedge q \wedge r$
2. $p \rightarrow (q \rightarrow r) \equiv (p \wedge q) \rightarrow r$
3. $p \leftrightarrow (q \wedge r) \equiv (p \rightarrow q) \wedge (p \rightarrow r) \wedge (\sim p \rightarrow \sim(q \wedge r))$

Problem 2 (4 points). Exercises 10, 11 p. 41.

Problem 3 (6 points). Exercises 42, 44 p. 43. Note that t here is just a name of a proposition, not a tautology.

Problem 4 (16 points). Prove the following using deductive proofs (not truth tables).

1.
$$\frac{(p \vee q) \rightarrow r}{\therefore \sim r \rightarrow \sim p}$$
2.
$$\frac{\sim(p \rightarrow q) \quad p \rightarrow r}{\therefore r}$$
3.
$$\frac{p \wedge \sim r \quad q \rightarrow r}{\therefore \sim(p \rightarrow q)}$$
 (use a proof by contradiction)
4.
$$\frac{(p \wedge q) \leftrightarrow r}{\therefore (r \rightarrow p) \wedge (r \rightarrow q)}$$

Problem 5 (6 points). Which of the following two arguments are valid (if any)? Justify your answer the following way: use deductive proofs or truth tables to prove a valid argument; show at least one row of a truth table to disprove an invalid argument.

You might want to guess the answer first, and then check your intuition.

$$A. \frac{(p \vee q) \rightarrow s}{\therefore q \rightarrow s}$$

$$B. \frac{(p \wedge q) \rightarrow s}{\therefore q \rightarrow s}$$