

Homework Assignment 1
CS 2233
Section 001 and Section 002
Due: 11:59pm Friday, January 26

Problem 1. [10 points]

Complete all participation activities in zyBook sections 1.1, 1.2, 1.3, 1.4, 1.5.

Problem 2. [15 points]

Let p denote “You passed CS 2233”.
Let q denote “You passed CS 3333”.
Let r denote “You can register for CS 3343”.
Let s denote “You understand propositional logic”.

Use p , q , r , and s , to create propositions representing the following statements.

- [5 points] You did not pass CS 2233, but you understand propositional logic.
- [5 points] You cannot register for CS 3343 only if you have not passed both CS 2233 and CS 3333
- [5 points] If you can register for CS 3343, then you have passed CS 2233, and you understand propositional logic if you passed CS 2233

Problem 3. [40 points]

Show that $(\neg q \wedge (p \vee p)) \rightarrow \neg q$ is a tautology, i.e. $(\neg q \wedge (p \vee p)) \rightarrow \neg q \equiv T$

- [10 points] By creating a truth table
- [10 points] By creating a sequence of logical equivalences and annotating each step

Show that $\neg q \rightarrow (p \wedge r) \equiv (\neg q \rightarrow r) \wedge (q \vee p)$

- [10 points] By creating a truth table
- [10 points] By creating a sequence of logical equivalences and annotating each step

Problem 4. [20 points]

- [10 points] Show that the \vee operator is associative by creating a truth table showing that $p \vee (q \vee r) \equiv (p \vee q) \vee r$.
- [10 points] The NOR operator \downarrow is the negation of a disjunction: $p \downarrow q \equiv \neg(p \vee q)$. Its truth table is:

p	q	$p \downarrow q$
T	T	F
T	F	F
F	T	F
F	F	T

Show that The NOR operator is not associative by creating a truth table showing that it is not the case that $p \downarrow (q \downarrow r) \equiv (p \downarrow q) \downarrow r$. In other words, create a truth table showing that $(p \downarrow (q \downarrow r)) \leftrightarrow ((p \downarrow q) \downarrow r)$ is not a tautology.