CSCI 301 - Assignment 2, Fall 2024

Your name here

Modify the .tex source file for this document, replacing the placeholders with your solutions. This is an individual assignment. See the syllabus for the collaboration policy.

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1. (2 points) Give the simplest expression you can find that is equivalent to $\overline{\overline{A} \cup \overline{B}}$. You may find it helpful to use Venn diagrams; you may, but aren't required to include them here.
   Answer
   Replace this text, including the emphasis, with your answer.

2. (4 points) Find a way to express $P \Rightarrow Q$ without using $\Rightarrow$; ideally your expression should be as simple as possible. Verify the equivalence using either truth tables or known equivalencies (see *Book of Proof* Section 2.6, page 52). If you use known equivalencies, point out what equivalency you apply for each step.
   Answer
   Replace this text, including the emphasis, with your answer.

3. Verify each of the following equivalencies in the same manner as in the prior question.

   (a) (2 points) $A \Rightarrow B \equiv (A \wedge \neg B) \Rightarrow False$.
   Answer
   Replace this text, including the emphasis, with your answer.

   (b) (2 points) $(A \wedge B) \Rightarrow C \equiv (A \Rightarrow C) \vee (B \Rightarrow C)$.
   Answer
   Replace this text, including the emphasis, with your answer.

4. For each of the following sentences, do the following three things: (i) Translate it into a symbolic logic form; (ii) Negate the logic form and then simplify it as much as you can; (iii) Translate the negated form back to a sensible English sentence. Define the symbols before you use them in step 1. As a shorthand for your symbolic representation, you can write "$E(x)$" as the statement that x is even, and $O(x)$ to say x is odd.

   (a) (2 points) The integer a and the integer b are not both odd.
   Answer
   Replace this text, including the emphasis, with your answer.

   (b) (4 points) Given any two integers a and b, if both ab and a+b are even, then both a and b are even.
   Answer
   Replace this text, including the emphasis, with your answer.

   (c) (4 points) There exists an integer x for which $x + y = 0$ for any integer y.
   Answer
   Replace this text, including the emphasis, with your answer.

Possibly Helpful Latex Things

Remove this section in your submission. Here are some examples of LaTeX syntax that may help you in answering some of the above questions.

A truth table:

P	Q	$P \Rightarrow Q$
T	T	T
T	F	F
F	T	T
F	F	T

An enumerated list:

1. Thing 1

2. Thing 2

3. Thing 3

An aligned sequence of equations, one per line:

$$y = mx + b$$
$$y - b = mx$$
$$\frac{y - b}{m} = x$$

If you want to include an image, see the commented-out syntax below.