Homework #2
(50 points)

Due Date: September 17th, 2021, at the beginning of class

Directions

1. This is an INDIVIDUAL assignment; do your own work! Submitting answers created by other people is NOT doing your own work.

2. Start early! Getting help is much easier n days before the due date/time than it will be n hours before.

3. The questions that have section numbers are found in the Rosen text, available via D2L. Note that “(w,z)” is asking you to complete parts w and z only, not parts x and y.

4. Write complete answers to each of the following questions, in accordance with the given directions. Create your solutions as a PDF document such that each question is on a separate page; all parts of a multi–part question may be on the same page. Show your work, when appropriate, for possible partial credit.

5. If you have questions about any aspect of this assignment, help is available from the class staff via piazza.com and our office hours.

6. When your answers are ready to be turned in, do so on gradescope.com. Be sure to assign pages to problems after you upload your PDF. Need help? Visit https://help.gradescope.com/ and search for “Submitting an Assignment.”

7. Solutions submitted after the first five minutes of class on the due date will not be accepted.

1. (4 points) Section 1.3, 8(a,c)

2. (8 points) Show that each of these logical equivalences are correct using sequences of equivalences from the Page O’ Logical Equivalences (not truth tables, not reasoning!). Remember to justify each of your steps.

   (a) \((p \lor p) \land (p \land \neg p) \equiv F\)

   (b) 

3. (4 points) Using reasoning (not truth tables, not a sequence of logical equivalences), show that the following expression is true. (Remember, you’re trying to show that both sides are equivalent in all situations, and that it is OK to use equivalences from the POLE to support your reasoning. Obviously, it is not OK to just say, “This is the Law of the Contrapositive!” and stop. You need to convince the reader that the expression is true by using reasoning. We presented an example of the reasoning approach in class on Sept. 10th.)

   • \(p \rightarrow q \equiv \neg q \rightarrow \neg p\)

(Continued . . .)
4. (4 points) Section 1.4, 6(b,d)
5. (2 points) Section 1.4, 8(d)
6. (4 points) Section 1.4, 20(a,c)
7. (2 points) Section 1.4, 22(a)
8. (4 points) For this English sentence, convert it to quantified predicates in two ways. First, use a domain of “Things” for people; second, use a domain of “People” for people. Use our “one step above Things” rule for any other items that need domains. Both versions should have the same meaning as the given sentence.
   • Everyone owns toenail clippers.
9. (4 points) Each of the following English sentences includes one or more implicit quantifications. Convert them to quantified predicates that mean the same as the original sentence, using the domain(s) given.
   (a) The sum of two integers is an integer. Domain: Numbers.
   (b) Grocery bags can be eyesores. Domain: Things.
10. (4 points) Section 1.5, 4(c,f)
11. (4 points) Section 1.5, 6(c,f)
12. (4 points) Section 1.5, 8(b,c)
13. (2 points) Section 1.5, 28(f)