

Homework #3

(75 points)

Due Date: March 31st, 2017, at the beginning of class

Solutions to homeworks in this class should be written using a word processor and are to be electronically submitted as a single PDF file (using `lectura`'s `turnin` utility).

Write complete, legible answers to each of the following questions. A problem identified as “C.q(x,z)” references parts x and z of question q from the end of chapter C of the Louden/Lambert text, 3rd edition. Show your work, when appropriate, for possible partial credit. This is not a group project; do your own work. We will post our solutions ≥ 24 hours after the due date (remember, you can use one late day on homeworks, so we can't give solutions on the due date).

On the due date, by the start of class, submit your electronically-formatted version of your solutions (the turnin folder is `cs372h3`). If you need to submit your solutions within the 24-hour late window, submit your PDF to the same turnin folder. Solutions submitted more than 24 hours after the due date and time will not be accepted.

Chapter 3 (Functional Programming)

1. (10 points) 3.1(a,b) (First, your printing of the text may have a typo in this question – the text should say a^b , not ab . Second, see Section 3.2.3 for a discussion of tail recursion and accumulating parameters.)

(The rest of the questions for this chapter require that you do some research on your own to learn the answers. In addition to answering the questions, provide references to the sources you consulted.)

2. (10 points) I didn't have enough time to talk much about “currying” in class while finishing up the Haskell material.
 - (a) Define the term “currying.”
 - (b) Explain what the expression “Haskell is a fully curried language” means.
3. (5 points) One of the most significant additions to Java 8 is lambda functions. As we know, Java is not considered to be a functional language. Why, then, did the maintainers of Java add lambda functions to Java 8? (We're looking for an answer with more depth than “Because lambda functions are kewl!”, in case you are wondering. It's a fairly easy question to answer, but not *that* easy.)
4. (10 points) We learned (or are about to, depending on when you read this) that interpreted languages, like Haskell, can be either statically or dynamically scoped.
 - (a) Which one is Haskell?
 - (b) Demonstrate, using a Haskell example of your own creation, that your answer to (a) is correct.
5. (10 points) Both Java and C include a feature known as “short-circuit evaluation” that plays a role in how boolean conditions are evaluated. You may have seen it or even used it before; if not, now's your chance to study and try it!
 - (a) Explain what short-circuit evaluation is, using a fragment of either Java or C code (your choice) as an illustrative example.
 - (b) Haskell doesn't use short-circuit evaluation. Why isn't it a feature that programmers would find useful in Haskell?

(Continued on back ...)

Chapter 7 (Basic Semantics)

6. (5 points) 7.3
7. (5 points) 7.7(a,b,c,d,e)
8. (10 points) 7.8(a,b), but use stack drawings for the variables, as I did in class. Don't forget to show the output for each version!
9. (5 points) 7.14
10. (5 points) 7.23