

CS350 – Lab 5

Due Date: March 7

Purpose: Computer scientists use reductions (using one problem to solve another problem) to show that a problem is hard. The purpose of this lab is for you to use reductions to show that problems are uncomputable.

Knowledge: This lab will help you become familiar with the following content knowledge:

- How to determine what information a reduction gives us.
- How to use reductions to show problems are uncomputable.

Task: Follow the steps in this lab carefully to complete the assignments.

Assignment 1:

Complete exercise 7.4 on p140 in the text.

Criteria for Success: For each of the three cases, you need to explain what you can deduce about problems F,G, and D. Also clearly explain if you can not deduce anything about any of the problems.

Assignment 2:

Complete exercise 7.5 on p140 in the text.

Criteria for Success: For each of the five problems, you have a complete clear proof that the problem is undecidable. You do this by reducing a problem we already know is undecidable to the given problem. I suggest you use the "technique 2" of writing two Python functions to perform the reduction. I reduced either `yesOnString` or `yesOnEmpty` to the given problems to show they are undecidable.

Your Python functions could look something like:

```
def alterP(inString): #alter the program P that is input to yesOnString
    # execute P(I)
    val = universal(rf('progString.txt'),rf('inString.txt'))
    if val == "yes":
        return "yes"
    else:
        return "no"

def yesOnStringViaNewProblem(P,I):
    utils.writeFile('progString.txt',P)
    utils.writeFile('inString.txt',I)
    # use the new decision problem on your alterP program
    # to answer yesOnString problem
```

Assignment 3:

Complete exercise 7.7 on p141 in the text.

Criteria for Success: You have a clear explanation why this reduction is not correct.

Assignment 4:

Complete exercise 7.15 on p142 in the text.

Criteria for Success: You have a complete clear proof that the problem is uncomputable. EFC is not a decision problem but the solution should be similar to your previous reductions nonetheless.

Submit your written answers in Canvas or on paper for grading.