CSCI 3104 Spring 2022
Instructor: Profs. Chen and Layer

Quiz 3 - Exchange Arguments

Due Date .... February 4
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Contents

1 Instructions

- The solutions **should be typed**, using proper mathematical notation. We cannot accept hand-written solutions. Here's a short intro to LaTeX.
- You should submit your work through the **class Canvas page** only. Please submit one PDF file, compiled using this LaTeX template.
- You may not need a full page for your solutions; pagebreaks are there to help Gradescope automatically find where each problem is. Even if you do not attempt every problem, please submit this document with no fewer pages than the blank template (or Gradescope has issues with it).
- You **may not collaborate with other students**. **Copying from any source is an Honor Code violation. Furthermore, all submissions must be in your own words and reflect your understanding of the material.** If there is any confusion about this policy, it is your responsibility to clarify before the due date.
- Posting to **any** service including, but not limited to Chegg, Discord, Reddit, StackExchange, etc., for help on an assignment is a violation of the Honor Code.
- You **must** virtually sign the Honor Code (see Section 2). Failure to do so will result in your assignment not being graded.

2 Honor Code (Make Sure to Virtually Sign)

Problem 1.

- My submission is in my own words and reflects my understanding of the material.
- I have not collaborated with any other person.
- I have not posted to external services including, but not limited to Chegg, Discord, Reddit, StackExchange, etc.
- I have neither copied nor provided others solutions they can copy.

Agreed (Alex Ojemann). I agree to the above, Alex Ojemann. □

3 Standard 3- Exchange Arguments

3.1 Problem 2

Problem 2. Suppose that there are n homework assignments, where the ith homework assignment has difficulty $d_i > 0$. All of the assignments are released on the first day of class, and you may turn in one assignment per week. If you turn in assignment i on week k, then you receive $(n-k)e^{d_i}$ points. Do the following.

(a) Consider a solution in which you turn in assignment j before assignment i, even though $d_i > d_j$. Show that you can increase the number of points earned by turning in assignment i before assignment j.

Proof. If you turn in assignment j on week k-1 and assignment i on week k, you earn $(n-k)e^{d_i} + (n-(k-1))e^{d_j}$ points. If you turn in assignment i on week k-1 and assignment j on week k, you earn $(n-k)e^{d_j} + (n-(k-1))e^{d_i}$ points.

$((n-k)e^{d_j} + (n-(k-1))e^{d_i}) - ((n-k)e^{d_i} + (n-(k-1))e^{d_j}) = e^{d_i} - e^{d_j} > 0$

Since the number of points achieved by turning in assignment i first minus the number of points achieved by turning in assignment j first is $e^{d_i} - e^{d_j}$ and e^{d_i} must be greater than e^{d_j} because we are given that $d_i > d_j$, you can increase the number of points earned by turning in assignment i before assignment j. □

(b) Using part (a), describe a greedy algorithm to order the assignments in order to maximize the number of points earned. Pseudo-code is not required, but you should provide enough detail that a CSCI 2270 student could reasonably be expected to implement the solution from your description.

Answer. This algorithm should choose the assignment with the highest difficulty allocate this assignment first. It should repeat this step of allocating the most difficult remaining assignment next until no more assignments are left. We know this will maximize the number of points earned because we proved that turning in more difficult assignments before less difficult assignments increases the number of points earned in step a. □