CSCI 332, Fall 2025
Homework 10

Due Monday, November 24 before 10am (note earlier due date due to Thanksgiving!)

Submission Requirements

- Type or clearly hand-write your solutions into a PDF format so that they are legible and professional. Submit your PDF on Gradescope.
- Do not submit your first draft. Type or clearly re-write your solutions for your final submission. If your submission is not legible, we will ask you to resubmit.
- Use Gradescope to assign problems to the correct page(s) in your solution. If you do not do this correctly, we will ask you to resubmit.

Academic Integrity

Remember, you may access ***any*** resource in preparing your solution to the homework. However, you ***must***

- write your solutions in your own words, and
- credit every resource you use (for example: "Bob Smith helped me on this problem. He took this course at UM in Fall 2020"; "I found a solution to a problem similar to this one in the lecture notes for a different course, found at this link: www.profzeno.com/agreatclass/lecture10"; "I asked ChatGPT how to solve part (c)"; "I put my solution for part (c) into ChatGPT to check that it was correct and it caught a missing case.") If you use the provided LaTeX template, you can use the `sources` environment for this. Ask if you need help!

1. (9 points) Choose any NP-Complete problem that we have not covered in class. To find examples, you could look the https://en.wikipedia.org/wiki/List_of_NP-complete_problems page on Wikipedia, or you may look anywhere else you like.

   (a) (2 points) In your own words, describe the problem by defining the input and the desired output. Make sure to frame the problem as a *decision* problem.

   (b) (2 point) Given an example "yes" instance of the problem, explain why it is a "yes" instance. (You may find examples in the literature, but please come up with your own here.)

   (c) (1 point) Given an example "no" instance of the problem, explain why it is a "no" instance. (You may find examples in the literature, but please come up with your own here.)

   (d) (4 points) Prove that the problem is in NP by giving

      i. a description of a certificate that can be used to verify "yes" instances of the problem, and

      ii. a description of a polynomial-time verification algorithm that takes as input an instance of the problem and a certificate, and that outputs "accept" if the instance is a "yes" instance

2.

3. (1 point) What outside resources did you use to help with this assignment?