CSCI 3104 Fall 2022
Instructors: Prof. Grochow and Chandra Kanth Nagesh

# Midterm S2

Due Date ..... Saturday Oct 8, 2022 4pm MT
Name ..... **Tyler Huynh**
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Quiz Code (enter in Canvas to get access to the LaTeX template) ..... **VcjV6ytO6K**

## Contents



## Instructions

- You may either type your work using this template, or you may handwrite your work and embed it as an image in this template. **If you choose to handwrite your work, the image must be legible, and oriented so that we do not have to rotate our screens to grade your work.** We have included some helpful LaTeX commands for including and rotating images commented out near the end of the LaTeX template.
- You should submit your work through the **class Gradescope 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. Failure to do so will result in your assignment not being graded.

## Honor Code (Make Sure to Virtually Sign)

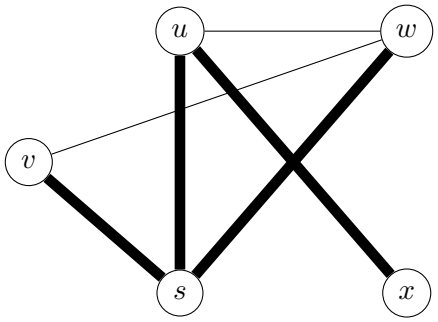
**Problem HC.**

- My submission is in my own words and reflects my understanding of the material.
- Any collaborations and external sources have been clearly cited in this document.
- I have not posted to external services including, but not limited to Chegg, Reddit, StackExchange, etc.
- I have neither copied nor provided others solutions they can copy.

*I agree to the above, Tyler Huynh.* □

## 2 Standard 2: Graph Search (BFS/DFS)

**Problem 2.** Consider the undirected, unweighted graph $G = (V, E)$ with $V = \{s, u, v, w, x\}$ and $E = \{su, sv, sw, uw, ux, vw\}$, and let $T \subseteq E$ be $T = \{sv, sw, su, ux\}$. This is pictured below with $T$ represented by wide edges.




Carefully explain why $T$ cannot be output by depth-first search (DFS) with start vertex $s$, regardless of the order in which DFS adds vertices to its stack (when it has a choice of order).

Tyler Huynh

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DFS

stack: [ ]

[s]

s[v, u, w]

v[u, w]

[w, u, w]

w[u, w]

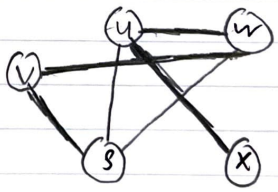
[u, u, w]

u[u, w]

[x, u, w]

x[u, w]

• This is an example of how DFS will vertices using the starting vertex S, when it has a choice of order.




• DFS will not produce the set of T as an output of DFS because DFS by definition will traverse the longest path first. The set of T={sv, sw, su, ux}, contains vertices that are not the longest path. No matter the ordering of vertices when pushed onto the stack, T cannot be an output, because even if we use do visit s → u → x, that would mean that the edge {u, w} would exist in T, but it does not due to the definition of a stack being LIFO.

*Answer.* □