CS/ECE 374 A ✧ Fall 2026

ᔕ Midterm 2 Practice 2 ᔓ

November 6, 2026

Name:	
NetID:	

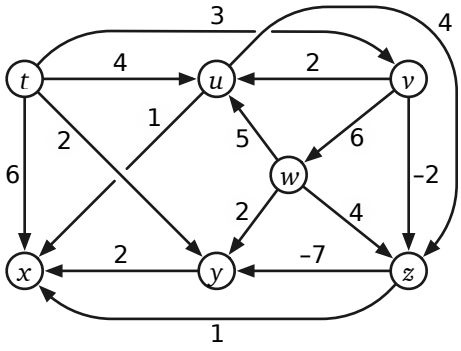
- ***Don't panic!***
- You have 120 minutes to answer five questions. **The questions are described in more detail in a separate handout.**
- If you brought anything except your writing implements, your **hand-written** double-sided 8½" × 11" cheat sheet, and your university ID, please put it away for the duration of the exam. In particular, please turn off and put away *all* medically unnecessary electronic devices.
- Please clearly print your name and your NetID in the boxes above.
- Please also print your name at the top of every page of the answer booklet, except this cover page. We want to make sure that if a staple falls out, we can reassemble your answer booklet. (It doesn't happen often, but it does happen.)
- Greedy algorithms require formal proofs of correctness to receive credit. Otherwise, proofs or other justifications beyond those listed in the standard grading rubrics are required if and only if we explicitly ask for them, using the word ***prove*** or ***justify*** in bold italics.

- **Do not write outside the black boxes on each page**. These indicate the area of the page that our scanners will actually scan. If the scanner can't see your work, we can't grade it.
- If you run out of space for an answer, feel free to use the overflow/scratch pages at the back of the answer booklet, but **clearly indicate where we should look**. If we can't find your work, we can't grade it.
- **Only work that is written into the stapled answer booklet will be graded**. We **do not** recommend detaching pages from the answer booklet, because any work on those detached pages will not be graded (and it disrupts our process for uploading solutions to Gradescope.) Please let us know if you detach a page either on purpose or accidentally so we can reattach it.
- We will provide additional blank scratch paper on request, but we will not grade anything written on it.
- **Please return all paper to Emily or a TA** including your **answer booklet**, your question sheet, your cheat sheet, and all scratch paper. There will be two piles of collected paper, the first for answer booklets and the second for everything else. We **will not** consider the paper in the second pile when grading your exam.

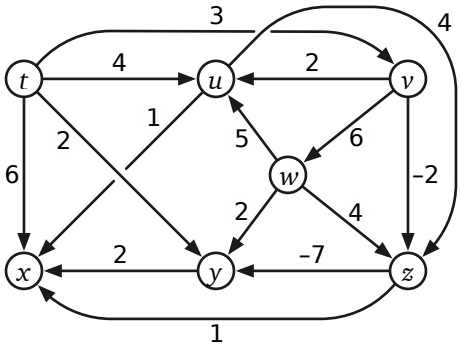
This sentence contains four and three fourths percent a's, five and one half percent c's, three percent d's, eighteen and one fourth percent e's, four and one half percent f's, three fourths percent g's, five percent h's, two and one half percent i's, two percent l's, twelve and one half percent n's, six percent o's, five percent p's, eight percent r's, seven percent s's, nine and three fourths percent t's, two and one fourth percent u's, one and one half percent v's, one and one fourth percent w's and one half percent x's.

CS/ECE 374 A ✧ Fall 2026 Midterm 2 Practice 2 Problem 1	Name:

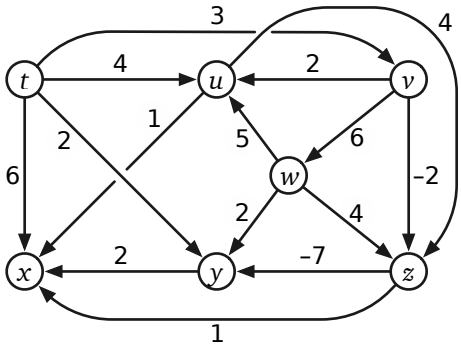
Clearly indicate the following structures in the directed graph below. Don't be subtle! To indicate a subset of edges, draw a **HEAVY BLACK LINE** along the entire length of each edge. If the requested structure does not exist, write the word NONE.



(a) A depth-first search tree rooted at v

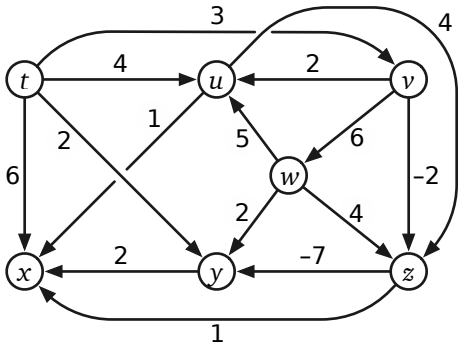


(b) A breadth-first search tree rooted at w

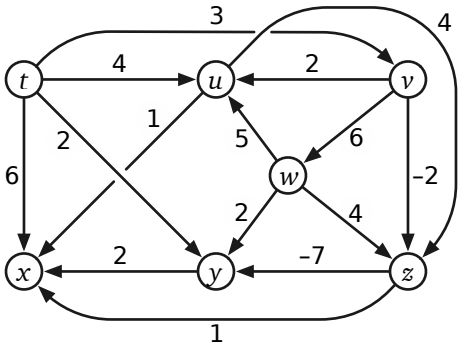


(c) A shortest-path tree rooted at t

(d) A list of vertices in topological order



[scratch]



[scratch]

CS/ECE 374 A ✧ Fall 2026 Midterm 2 Practice 2 Problem 2	Name:

Suppose you are given a directed graph $G = (V, E)$, each of whose edges are colored red, green, or blue. Edges in G do not have weights, and G is not necessarily a dag. A *rainbow walk* is a walk in G that does *not* contain two consecutive edges with the same color.

Describe and analyze an algorithm to find all vertices in G that are reachable from a given vertex s through a rainbow walk.

CS/ECE 374 A ✧ Fall 2026 Midterm 2 Practice 2 Problem 3	Name:

Suppose we are given an n-digit integer X. Repeatedly remove one digit from either end of X (your choice) until no digits are left. The *square-depth* of X is the maximum number of perfect squares that you can see during this process.

Describe and analyze an algorithm to compute the square-depth of a given integer X, represented as an array $X[1..n]$ of n decimal digits. Assume you have access to a subroutine IsSquare that determines whether a given k-digit number (represented by an array of digits) is a perfect square ***in $O(k^2)$ time***.

CS/ECE 374 A ✧ Fall 2026 Midterm 2 Practice 2 Problem 4	Name:

Suppose you are given k sorted arrays $A_1[1..n], A_2[1..n], \ldots, A_k[1..n]$, all with the same length n. Describe an algorithm to merge the given arrays into a single sorted array. Analyze the running time of your algorithm as a function of n and k.

CS/ECE 374 A ✧ Fall 2026 Midterm 2 Practice 2 Problem 5	Name:

Suppose you are given a directed acyclic graph $G = (V, E)$, where every vertex represents a required class and each edge $u \to v$ indicates that class u must be completed before you can begin class v.

(a) Describe an algorithm that computes a class schedule that uses the minimum number of terms. For each class, the output of your algorithm should specify the term when you will take that class.

(b) Describe an algorithm that computes the minimum number of terms required to take ***at least 75%*** of the classes represented in G, while still obeying all prerequisite constraints.

(scratch paper)

(scratch paper)

(scratch paper)

(scratch paper)

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