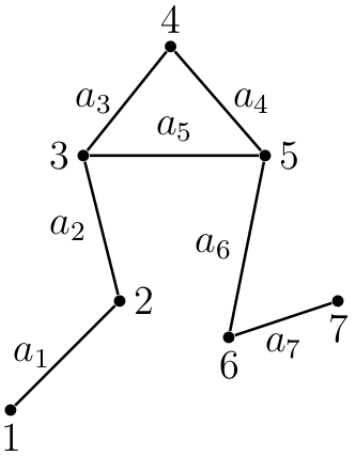
CS 241: Spring 2022 **HW 9** **Due 3 May 11:59pm**

Name: _____ Student ID: _____

Instructions. Print out this assignment, fill in your answers in the space provided and upload your work to Gradescope. **Important**. You must write your answers on a printout of this pdf! Please do not upload additional pages or scratch work.

1. (22 points) Answer the following questions about the graph shown.



(a) Is the graph simple? ◯ Yes ◯ No

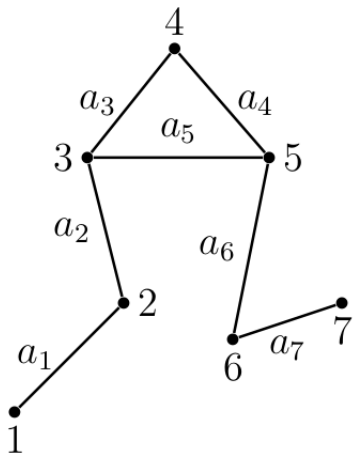
(b) Is the graph complete? ◯ Yes ◯ No

(c) Is it possible to change the answer to part (b) by adding a single edge to the graph?
◯ Yes ◯ No

(d) Is the graph connected? ◯ Yes ◯ No

(e) Is it possible to change the answer to part (d) by adding a single edge to the graph?
◯ Yes ◯ No

(f) Is it possible to change the answer to part (d) by removing a single edge from the graph?
◯ Yes ◯ No



(g) Can you find a cycle? ◯ Yes ◯ No

(h) Can you find an edge whose removal will make the graph acyclic (i.e., no cycles)?
◯ Yes ◯ No

(i) Is the graph a tree? ◯ Yes ◯ No

(j) Is it possible to change the answer to part (i) by adding a single edge to the graph?
◯ Yes ◯ No

(k) Is it possible to change the answer to part (i) by removing a single edge from the graph?
◯ Yes ◯ No

2. (8 points) For each part of this exercise, say whether or not a graph with the given characteristics exists. (When in doubt, start by trying to draw such a graph on a piece of paper.)

   (a) A simple graph with seven nodes, each of degree 3.

   ◯ Such a graph exists. ◯ No such graph exists.

   (b) A graph with four nodes, two of degree 2 and two of degree 3.

   ◯ Such a graph exists. ◯ No such graph exists.

   (c) A graph with three nodes of degree 0, 1, and 3, respectively.

   ◯ Such a graph exists. ◯ No such graph exists.

   (d) A complete graph with four nodes each of degree 2.

   ◯ Such a graph exists. ◯ No such graph exists.