CSSE 230

Name:

Problems

1. Consider the following algorithm. Note: for simplicity, please assume that the diagonal elements $A[i, i]$, $i = 0..n - 1$, are never zero at any time.

   ALGORITHM GE($A[0..n - 1, 0..n]$)
   //Input: An $n \times (n + 1)$ matrix $A[0..n - 1, 0..n]$ of fixed-length numbers
   for $i \leftarrow 0$ **to** $n - 2$ **do**
       for $j \leftarrow i + 1$ **to** $n - 1$ **do**
           for $k \leftarrow i$ **to** n **do**
               $A[j, k] \leftarrow A[j, k] - A[i, k] \cdot A[j, i]/A[i, i]$

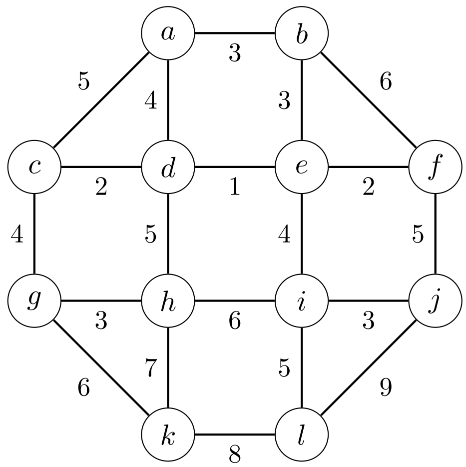
   (a) Find the time efficiency class of this algorithm. Show all work, i.e., choose a basic operation, accurately count the number of basic operations, and simplify this formula to a precise closed-form before evaluating its asymptotic growth order. Suggestion: use the tabular method from CSSE230.

   (b) What glaring inefficiency does this pseudocode contain and how can it be eliminated to speed up the algorithm?

2. For the following graph, complete either (a) or (b).

   (a) Run Prim's algorithm to find a minimum spanning tree. Use a as the start vertex. Break ties alphabetically (according to the vertex being added to the tree). To show your work and solution, list the edges of the MST in the order they are found by Prim's.

   (b) Run Kruskals algorithm to find a minimum spanning tree. Break ties alphabetically (according to the first of the two letters associated with the edge being added to the tree). To show your work and solution, list the edges of the MST in the order they are found by Kruskal's.


a
b
c
d
e
f
g
h
i
j
k
l
3
5
4
3
6
2
1
2
4
5
4
5
3
6
3
6
7
5
9
8