MAT385 Test 2: Chapters 3.1, 5, 6, and 7.1

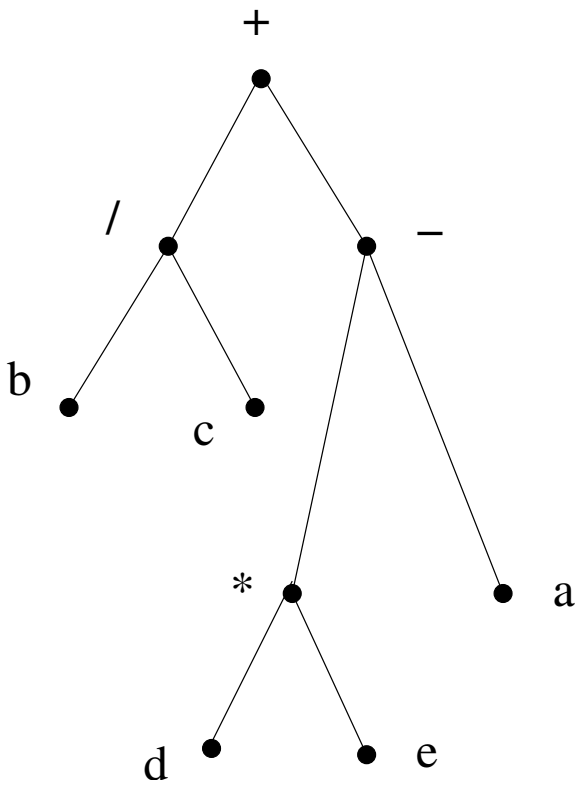
Name:

Directions:

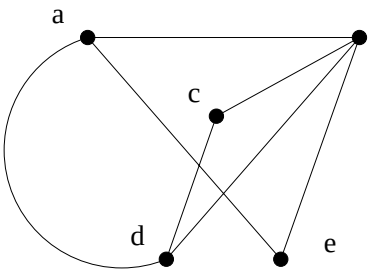
- All problems are equally weighted.
- Show your work! Answers without justification will likely result in few points. Your written work also allows me the option of giving you partial credit in the event of an incorrect final answer (but good reasoning).
- Indicate clearly your answer to each problem (e.g., put a box around it).
- **Good luck!**

Problem 1. For the tree below, perform the following traversals (you may simply list the results of each traversal next to the corresponding method):

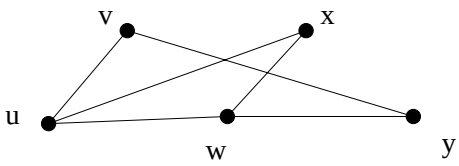
1. inorder
2. preorder
3. postorder
4. general graph depth-first traversal
5. general graph breadth-first traversal



Problem 2. For the following graphs, demonstrate conclusively whether they are, or are not, isomorphic:

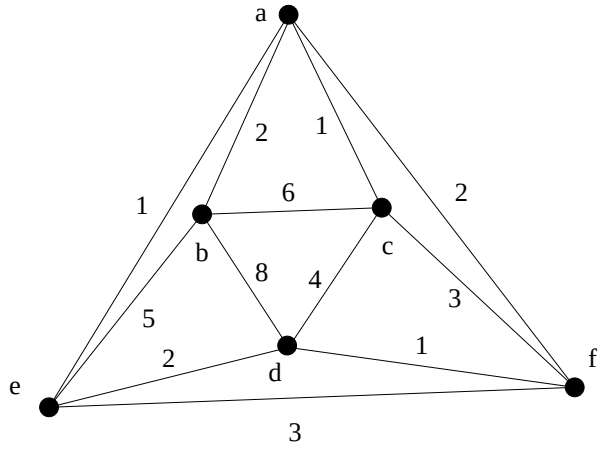


Graph 1

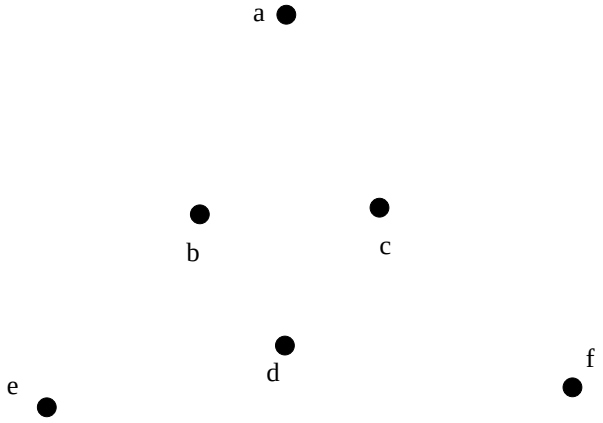


Graph 2

Problem 3. Consider the graph below (called "Original Graph", to the left):



Original Graph



Minimal Spanning Tree

1. Draw a minimal spanning tree for this graph through the vertices next to the graph above. Indicate the total weight of this minimal tree in the space below.

2. Produce an adjacency matrix which represents the graph (with the nodes listed in alphabetical order, to make the grader happy!).

3. Determine whether an Euler path exists. If so, indicate how to trace it, starting from node a.

Problem 4. Using the ten basic properties (1-5a, 1-5b) of a Boolean algebra, and the uniqueness of the identity, prove that

1.

$$(x \cdot y)' = x' + y'$$

2.

$$(x + y)' = x' \cdot y'$$

for any Boolean algebra.

Problem 5. Consider the list (t,h,i,s,w,i,c,k,e,d,t,r,e,e).

1. Create a binary search tree from the list (entered in list order).

2. What is the theoretical worst case number of comparisons for binary tree search using a tree with this many nodes?

3. What is the worst case number of comparisons for binary tree search using this tree?

Problem 6. Consider the set $A = \{m, a, t, h\}$.

1. Is this the same as the set $\{a, t, h, m\}$? Why or why not?

2. Is the set $\{\{a, t\}\}$ a member of the power set of A? Why or why not?

3. Give an example of a binary operation defined on this set.

4. How many distinctly different binary operations can be defined on this set?