CSI 35, Homework 13 on sections 11.3, 11.4, 11.5

Due by Mon, May 12.

Please use lots of space and explain your answers, showing clearly any work you had to do. Each question is worth 5 points.

Section 11.3 Tree traversal

(1) Label the vertices of this rooted tree with the universal address system. Then order these vertices using the lexicographic order.



(3) Draw the binary tree representation of

$$((x-4)\uparrow 2)*(y-(x+8))+5$$

and use this to give it in

- (a) prefix notation,
- (b) infix notation,
- (c) postfix notation.

(4) Compute these prefix expressions involving single digit numbers:

(a) - * 2 / 8 4 3(b) $\uparrow - * 3 3 * 4 2 5$ (c) $+ - \uparrow 3 2 \uparrow 2 3 / 6 - 4 2$

(Here * means multiplication, / is division and \uparrow means "to the power of".)

Section 11.4 Spanning trees

- (5) (a) In your own words, explain what the *spanning tree* of a connected graph is.
 - (b) Draw a spanning tree for this graph:



- (a) Choose *a* as the root and use a depth-first search to make a spanning tree. At each step choose the next possible vertex that comes first alphabetically.
- (b) Choose *a* as the root and use a breath-first search to make a spanning tree. Use the alphabetical order of the vertices.
- (7) Use backtracking to find a subset, if it exists, of the set $\{27, 24, 19, 14, 11, 8\}$
 - (a) with sum 20,
 - **(b)** with sum 41,
 - (c) with sum 60.

Section 11.5 Minimum spanning trees

(8) Draw the cycle graph C_7 and make it a weighted graph by adding the weights

to the edges. Give the minimum spanning tree for this graph.

(9) Use Prim's algorithm to find a minimum spanning tree for this weighted graph. Explain the steps.



- (10) In your own words, describe the difference between Prim's algorithm and Kruskal's algorithm. Then use Kruskal's algorithm to find a minimum spanning tree for the weighted graph in the last question.
- (11) Use Kruskal's algorithm to find a minimum spanning tree for this weighted graph and give the sum of the weights of the minimum spanning tree you find.



(12) Use Kruskal's algorithm to find a minimum spanning tree for this weighted graph and give the sum of the weights of the minimum spanning tree you find.



If you get stuck on a question or aren't sure if you understand it:

- Go over the relevant class notes or section in the textbook.
- Ask me about it after class.
- Come to my office hours: Mon 2:00 3:00, Wed 2:00 3:00 in CP 317.
- Go to the Math Tutorial Lab in-person in CP 303 or online.