

University of Nevada, Las Vegas Computer Science 477/677 Fall 2015

Assignment 5: Due October 7, 2015

Name: \_\_\_\_\_

You are permitted to work in groups, get help from others, read books, and use the internet. But the handwriting on this document must be your own. You may attach extra sheets, using a stapler.

1. A graph  $G$  is represented as a triangular array  $A$ , where  $A[i, j]$  is defined only if  $j < i$ . This triangular array is represented in row-major order as a linear array of Boolean, where 0 and 1 represent false and true, respectively. The values of  $A$  are:

100000110011001000100

Sketch  $G$ .

2. A directed graph  $G$  is represented as an array of out-neighbor lists as shown below.

(a) Write the array of in-neighbor lists of  $G$ .

(b) Sketch  $G$ .

$a : b, e$

$b : d$

$c : b, d$

$d : b$

$e : d$

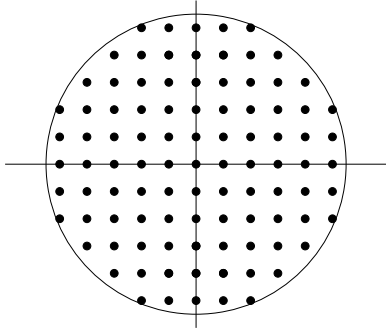
3. A connected weighted graph  $G$  is represented as a list of weighted edges, below. Sketch  $G$  and find its minimum spanning tree by using Kruskal's algorithm.

$(\{a, b\}, 6), (\{g, e\}, 7), (\{f, c\}, 9), (\{d, a\}, 6), (\{g, h\}, 3), (\{c, e\}, 6), (\{c, g\}, 5), (\{d, e\}, 7), (\{c, h\}, 4),$   
 $(\{c, b\}, 7), (\{f, b\}, 8), (\{f, d\}, 8), (\{f, e\}, 2), (\{f, a\}, 1)$

4. This is a ragged array problem. For a certain simulation program, we need to calculate the evolution of the temperature function of a circular plate of radius 5.5 inches. We will simulate the temperature function by simulating the temperature at all integer points  $(x, y)$  such that  $x^2 + y^2 \leq 5.5^2$ . There are 97 such points (count 'em). We can think of temperature as being stored in a ragged array T.

T will be represented as a one-dimensional array A of size 97, together with an auxiliary “offset” array B. The temperature  $T(x, y)$  at the point  $(x, y)$  will be stored as  $A[B[x] + y]$ . The values of B are computed at the beginning of the simulation and do not change.

How large is the array B? List its values.



5. (Problem to be added later.)