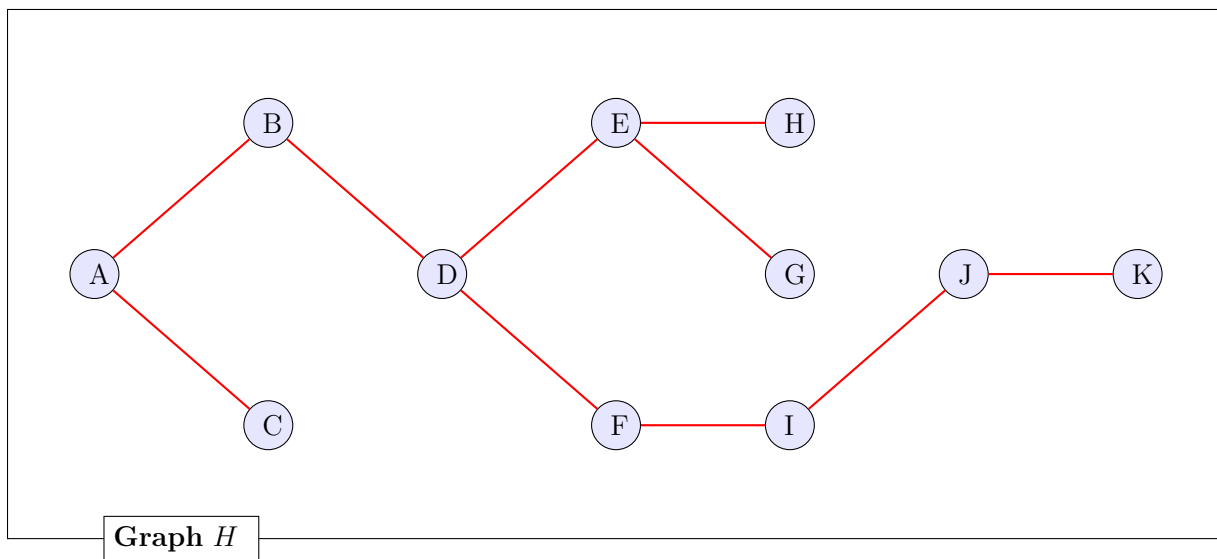
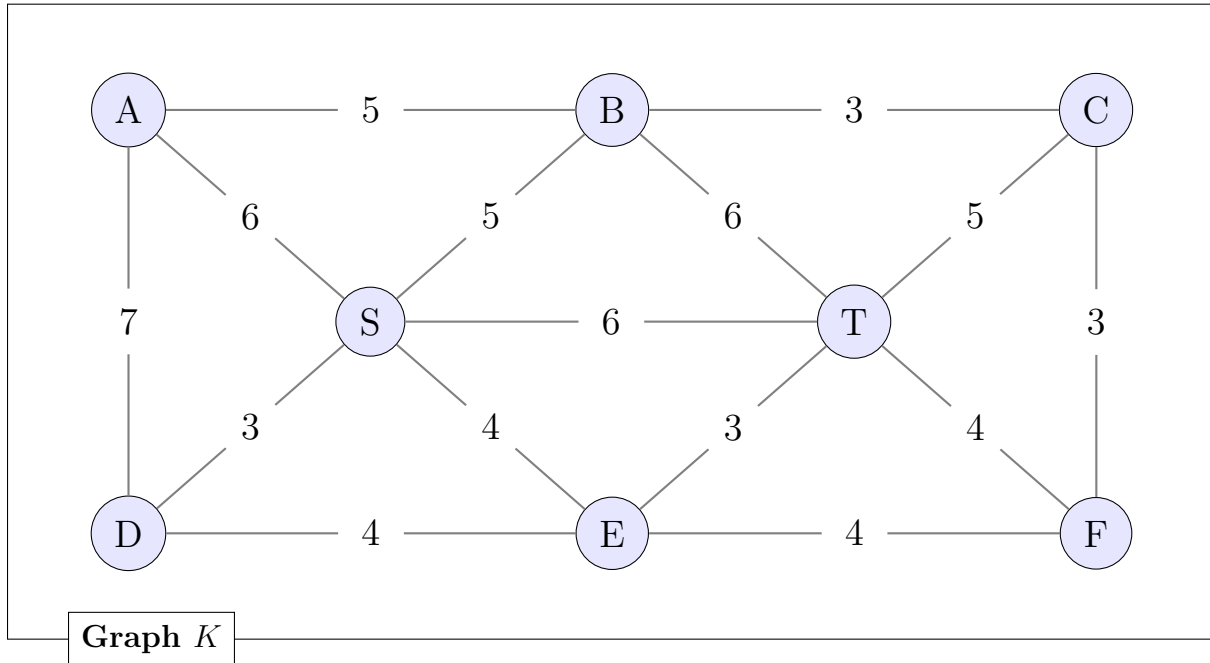


tear off

Data Sheet



CIS 3223 Homework 6

Dr Anthony Hughes

Name:

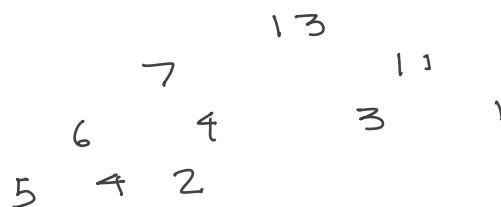
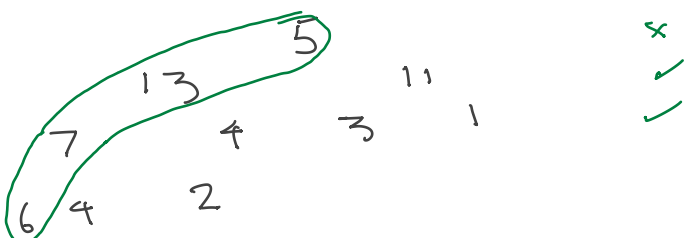
Temple ID (last 4 digits:

Simple non-graphing calculator

Make:

1 (12 pts) Consider the array $H = [5, 13, 11, 7, 4, 3, 1, 6, 4, 2]$ of integers.

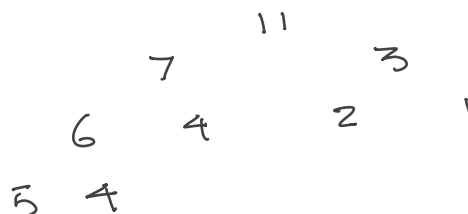
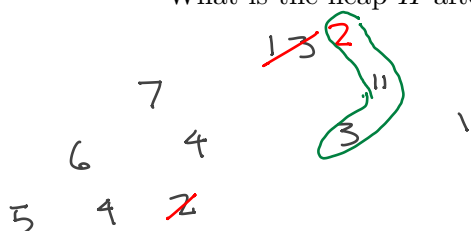
For heapsort implemented using a binary tree, what is the heap H after it has been heapified?



$H =$

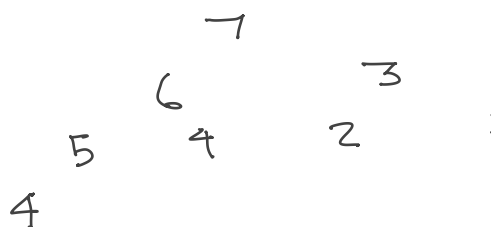
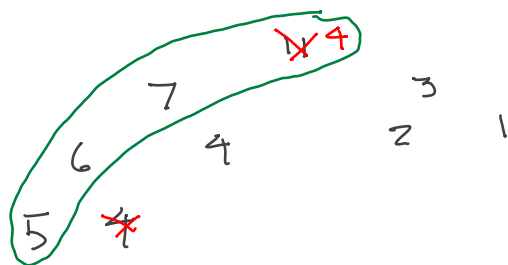
13	7	11	6	4	3	1	5	4	2
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What is the heap H after two complete cycles of heapsort?



$H =$

11	7	3	6	4	2	1	5	4	13
----	---	---	---	---	---	---	---	---	----



$H =$

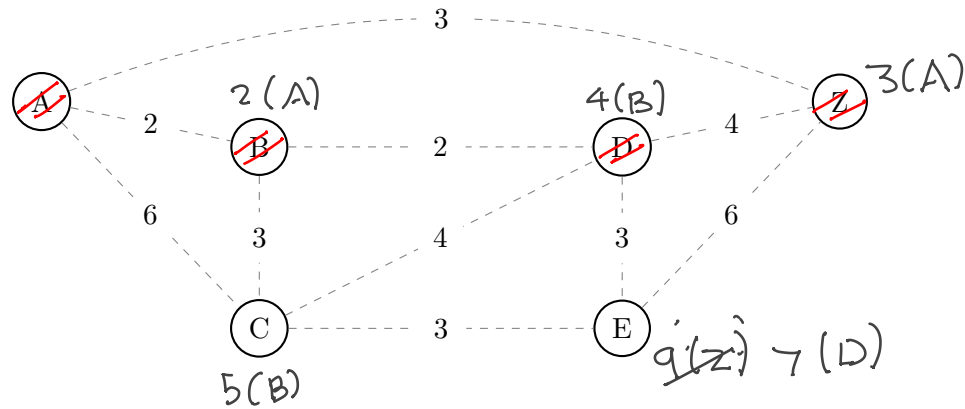
7	6	3	5	4	2	1	4	11	13
---	---	---	---	---	---	---	---	----	----

2 (4 pts) Consider a node at position j , $j \geq 2$, in a complete 3-ary tree. Find the positions of its parent and its three children. Note that the position of the root of the tree is 1.

position of parent: $\lfloor \frac{j+1}{3} \rfloor$

positions of children: $3j-1$ $3j$ $3j+1$

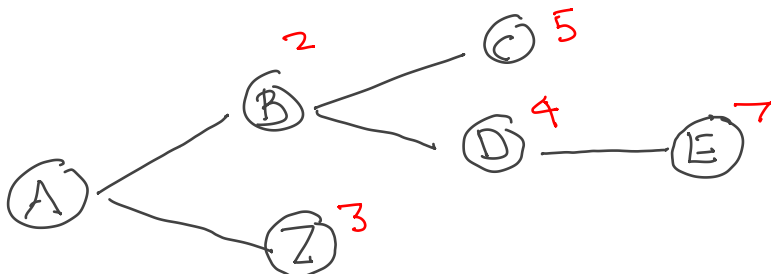
3 (8 pts) Run Dijkstra's algorithm for finding the shortest path from A.



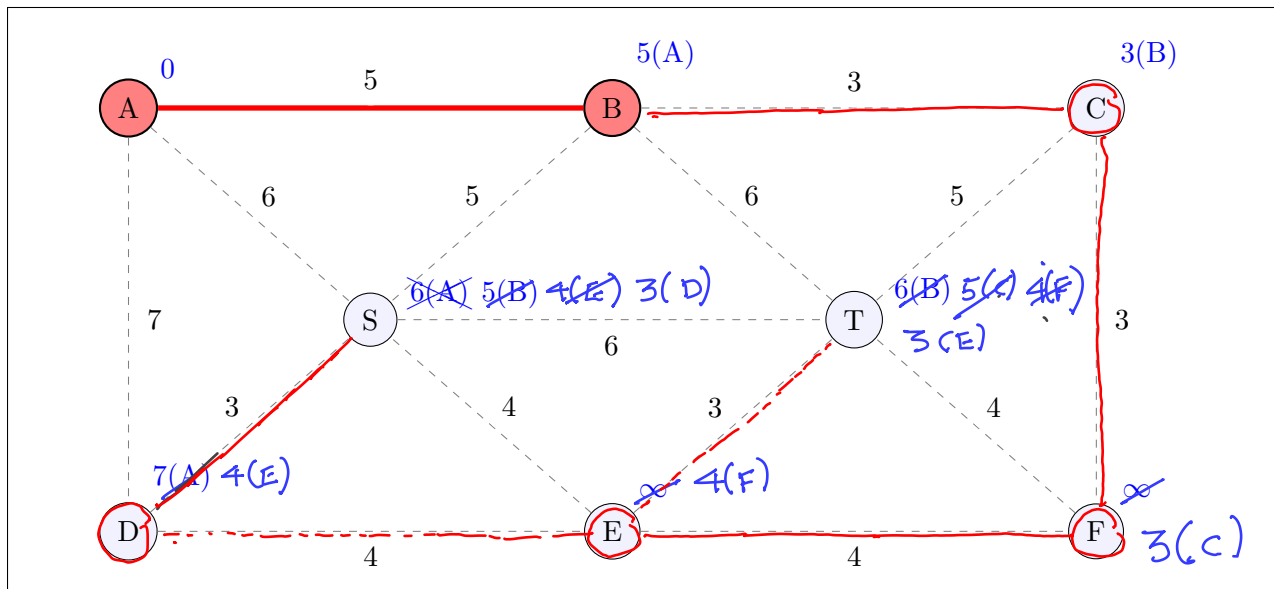
A	B	C	D	E	Z	Delete
0	∞	∞	∞	∞	∞	A
X	2(A)	6(A)	∞	∞	3(A)	B
X	X	5(B)	4(B)	∞	3(A)	Z
X	X	5(B)	4(B)	9(Z)	X	D
X	X	5(B)	X	7(E)	X	C
X	X	X	X	7(E)	X	E
X	X	X	X	X	X	

parent	A	A	B	B	D	A
dist	0	2	5	4	7	3
vertex	A	B	C	D	E	Z

Draw a spanning tree (horizontally and add the distances.



4 (18 pts) Run the first 6 steps of Prim's algorithm on Graph K starting at A. The first two steps have been completed.



deletemin \rightarrow A Children of A updated: $\text{cost}(B) = 5, \text{cost}(D) = 7, \text{cost}(S) = 6$

deletemin \rightarrow B AB added to tree

Children of B updated: $\text{cost}(C) = 3, \text{cost}(S) = 5, \text{cost}(T) = 6$

deletemin \rightarrow C C updated: $\text{cost}(F) = 3, \text{cost}(T) = 5$

deletemin \rightarrow F F updated: $\text{cost}(E) = 4, \text{cost}(T) = 4$

deletemin \rightarrow E E updated $\text{cost}(D) = 4, \text{cost}(S) = 4, \text{cost}(T) = 3$

deletemin \rightarrow T T updated

----- completion

deletemin \rightarrow D D updated $\text{cost}(S) = 3$

deletemin \rightarrow S done

List the 6 vertices deleted: A B C F E T

5 (16 pts) Consider graph H.

(a) Run the DFS topological ordering algorithm on the graph. Whenever there is a choice, use alphabetical ordering.

J	K	13	14
I	J	12	15
F	I	11	16
E	H	5	6
E	G	7	8
D	E	4	9
D	F	10	17
B	D	3	18
A	B	2	19
A	C	20	21
A	A	1	22
parent	stack	pre	post

(b) Redraw the graph with the vertices listed in descending post order (topological sort).

