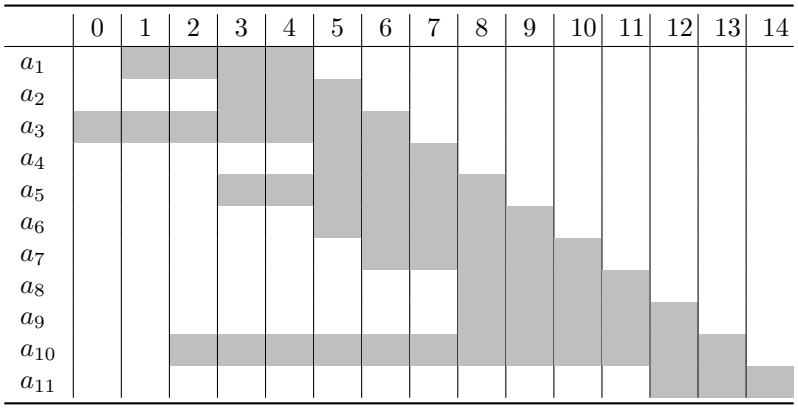
Homework #4

Illya Starikov

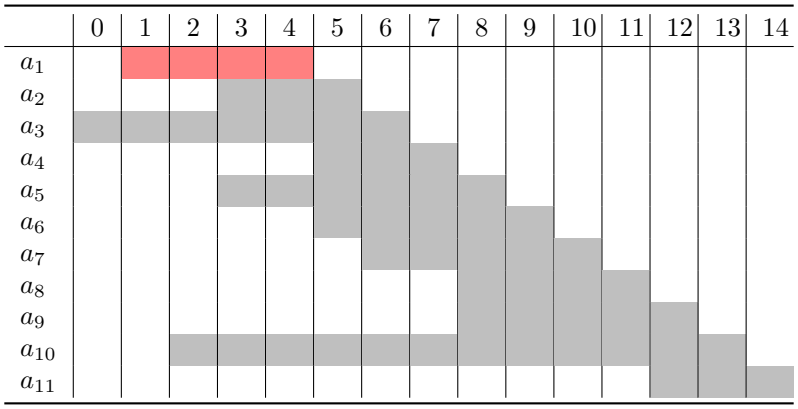
Due Date: March 23, 2016

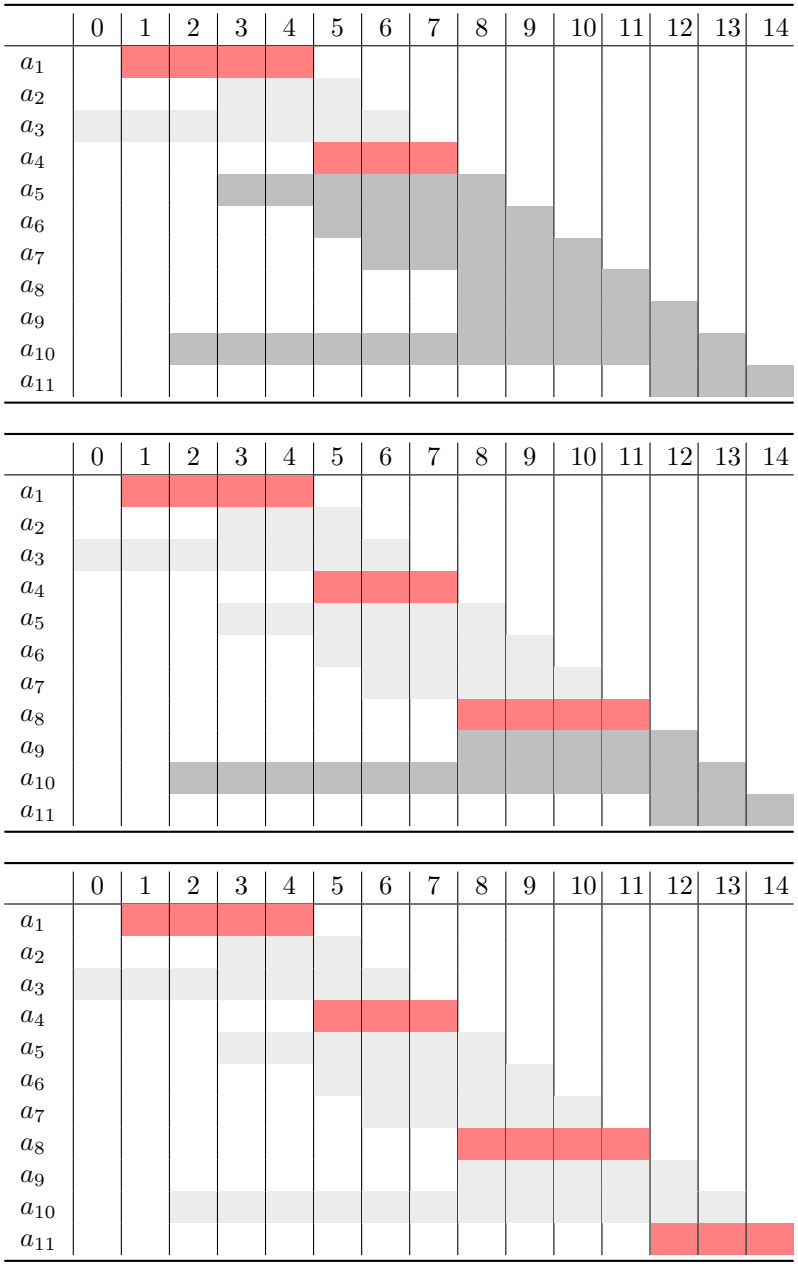
1 Activity Selection Problem

Plotting this out on a graph,

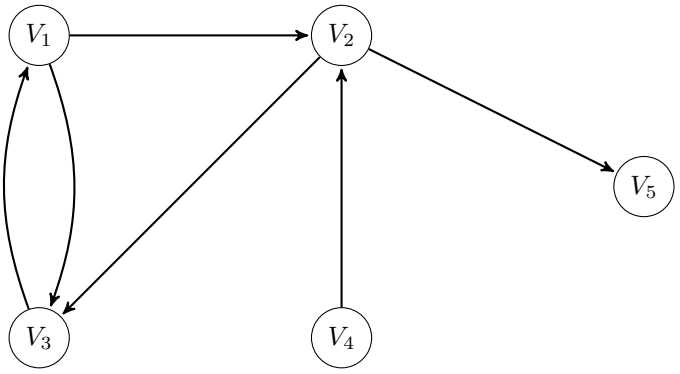


We can plainly see the optimal solution to be $\{a_1, a_4, a_8, a_{11}\}$. We get this solution by using the ending first greedy algorithm. Here are the steps to obtain the solution.




0 1 2 3 4 5 6 7 8 9 10 11 12 13 14
a_1
a_2
a_3
a_4
a_5
a_6
a_7
a_8
a_9
a_{10}
a_{11}

2 Graph And Depth First Search



2.1 Depth First Search

Ouput:	V_1	V_2	V_3	V_5	V_4
Distance:	0	1	1	2	∞

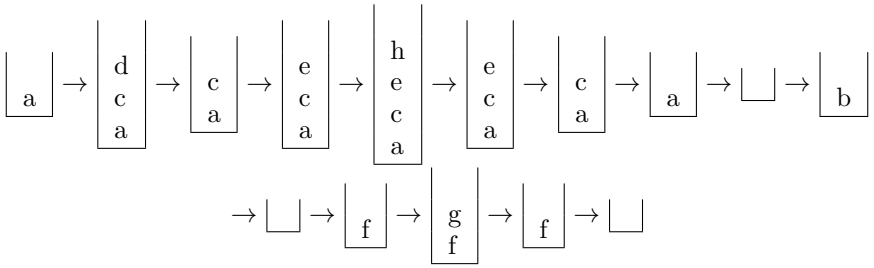
2.1.1 Queue Status

V_1
V_2 V_3
V_3 V_5
V_5
V_4

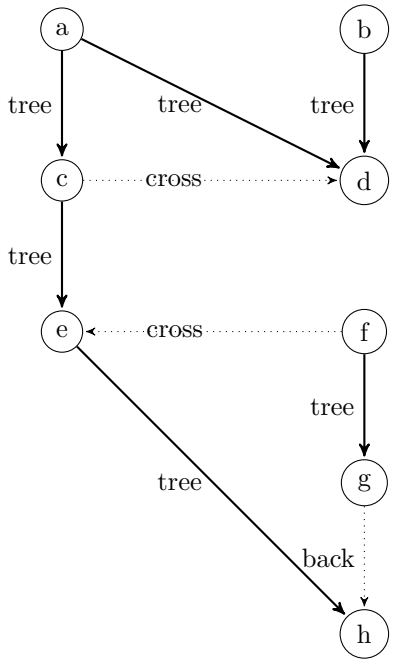
3 Depth First Search and Topological Sorting

Ouput	**Discovery**	**Finish**
a	1	10
c	2	9
d	3	4
e	5	8
h	6	7
b	11	12
f	13	16
g	14	15

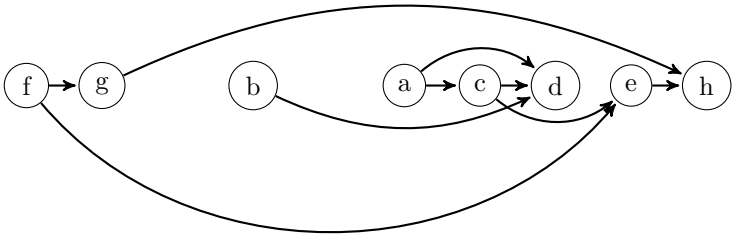
3.0.1 Queue Status



3.0.2 Edge Classification



3.0.3 Topological Sorting



4 Kruskal's and Prim's Algorithm

Please note that my tables are different, however the algorithm is the same is the same.

4.1 Kruskal

Kruskal's works the same way, except my column headers are more verbose and there an Iteration Number column, making it easy to keep track of large algorithms.

Iteration Number	Edge	Weight	Action Taken
1	$\{u,\ y\}$	1	Added
1	$\{u,\ x\}$	1	Added
2	$\{s,\ t\}$	2	Added
3	$\{t,\ y\}$	2	Added
4	$\{s,\ u\}$	3	Not Added
5	$\{s,\ x\}$	3	Not Added
6	$\{t,\ x\}$	3	Not Added

4.2 Prim

Prim's is also the same, with the exception that my headers are also verbose and the table is sorted linearly by the vertexes and edges that are added. The process is still the same of starting a vertex and branching out based on the best possible choice at the moment.

Iteration Number	Vertex Added	Edge Added	Weight
0	s		
1	t	$\{s,\ t\}$	2
2	x	$\{t,\ y\}$	2
3	u	$\{y,\ u\}$	1
4	y	$\{u,\ x\}$	1

Both algorithms produce the same result.