

Matthew Buck

CIS 27 LAB 4

(1a)

Ex. 4.1.2

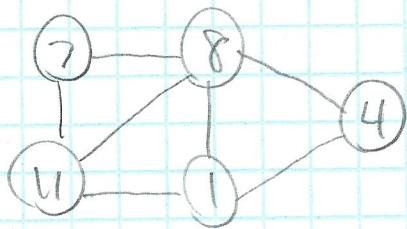
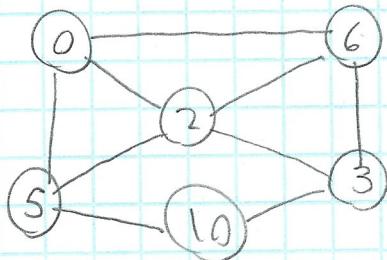
pg. 558

Adjacency List Undirected Graphs

graph

Adj[]

0		6	2	5
1		8	4	11
2		6	3	5 0
3		6	10	2
4		1	8	
5		0	2	10
6		3	2	0
7		8	11	
8		4	1	11 7
9		null		
10		3	5	
11		7	8	1



11

11

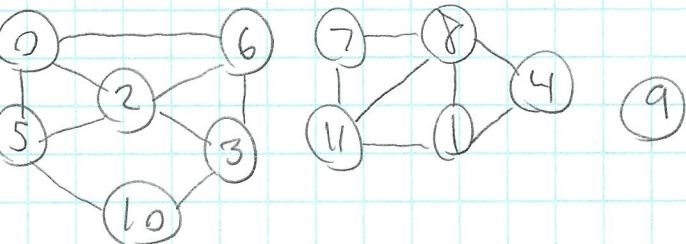
① b EX. 4.1.9 (pg. 558) (pg. 533)

adj[]

Undirected Graphs Depth First Search

0	6	2	5	
1	8	4	11	0
2	6	3	5	
3	6	10	2	
4	1	8		
5	0	2	10	
6	3	2	0	
7	8	11		
8	4	1	11	7
9	null			
10	3	5		
11	7	8	1	

graph



To visit a vertex V :

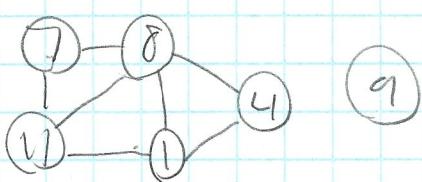
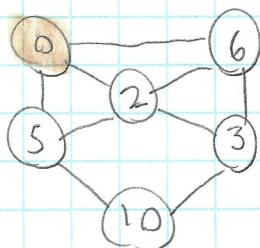
Mark V as visited,

Recursively visit all unmarked vertices adjacent to V .

dfs(0)

marked[]

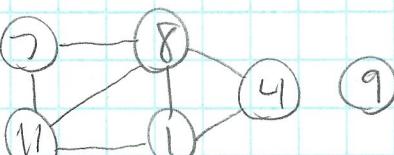
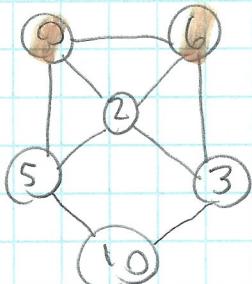
0	1	2	3	4	5	6	7	8	9	10	11
T	F	F	F	F	F	F	F	F	F	F	F



$$\text{adj}[0] = \{6, 2, 5\}$$

0	1	2	3	4	5	6	7	8	9	10	11
T											

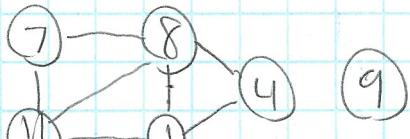
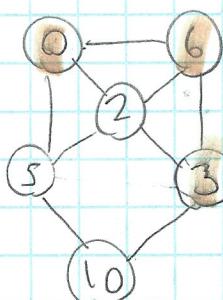
dfs(6)



$$\text{adj}[6] = \{3, 2, 0\}$$

0	1	2	3	4	5	6	7	8	9	10	11
T											

dfs(3)

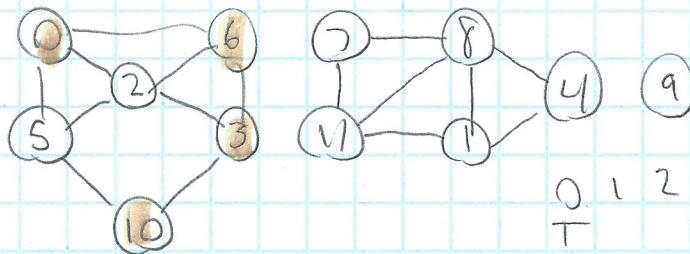


$$\text{adj}[3] = \{8, 10, 2\}$$

0	1	2	3	4	5	6	7	8	9	10	11
T											

(2)

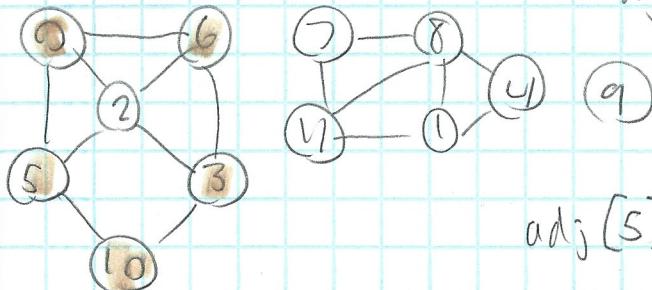
dfs(10)



0 1 2 3 4 5 6 7 8 9 10 11
T T T T T T

adj[10] = 3, 5

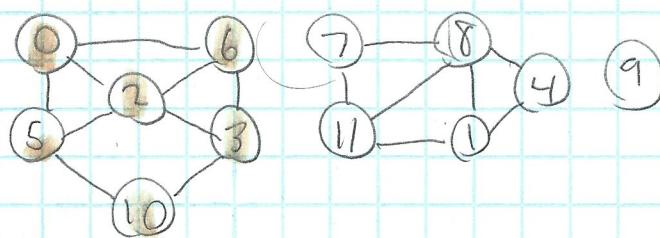
dfs(5)



0 1 2 3 4 5 6 7 8 9 10 11
T T T T T T

adj[5] = 0, 2, 3, 10

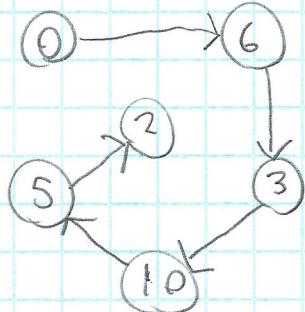
dfs(2)



0 1 2 3 4 5 6 7 8 9 10 11
T T T T T T

adj[2] = 0, 3, 5, 10

All vertices that are reachable from 0 have been visited.

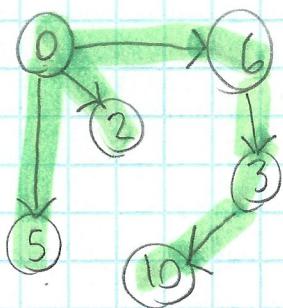
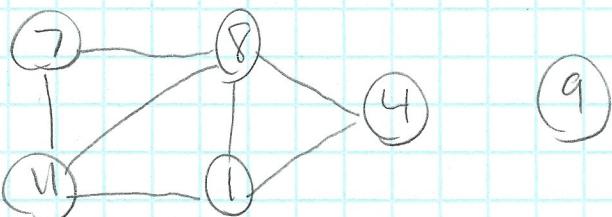
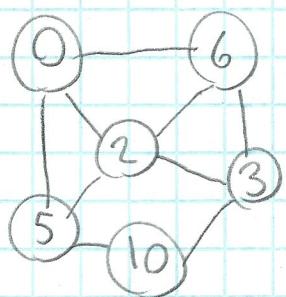


(1) G

Ex 4.1.11

Edge To C Tree

breadth first search(G, 0)



(4)

EX 4.1.19

① d

Connected components Trace

cT Market[]

id[]

0 TFTIFTFFF+F 00000000000000

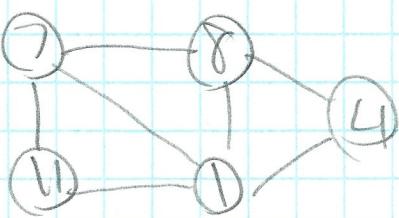
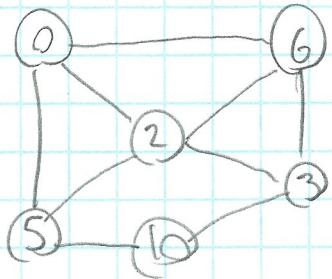
0 TFTFTFTFFF+F 00000000000000

0 TFTTFFTFFF+F 00000000000000

1 TTTFTTTFTT 010000011001

1 +TTTTTTTFTT 010010011001

index 0 1 2 3 4 5 6 7 8 9 10 11 0 1 2 3 4 5 6 7 8 9 10 11

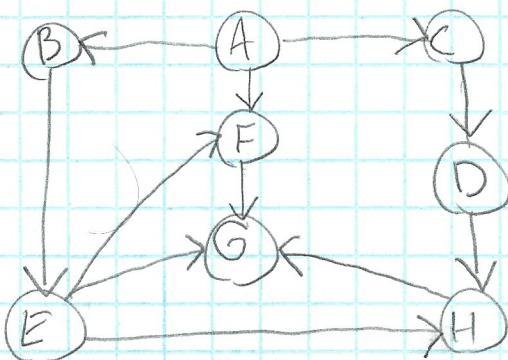


⑨

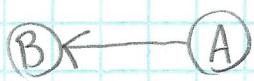
⑤

2a

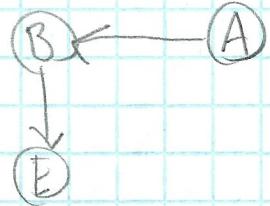
Depth first Search Directed Graph



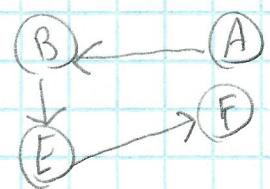
marked []	A B C D E F G H
marked []	T
edgeTo []	-



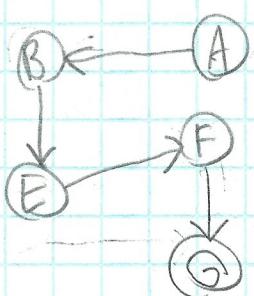
marked []	A B C D E F G H
marked []	T T
edgeTo []	- A



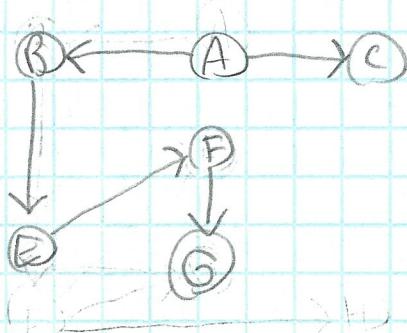
marked []	T T
edgeTo []	- A
	T
	B



marked []	T T
edgeTo []	- A
	T T
	B E



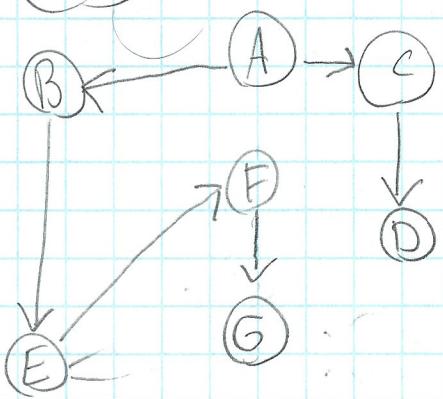
marked []	T T
edgeTo []	- A
	T T T
	B E F



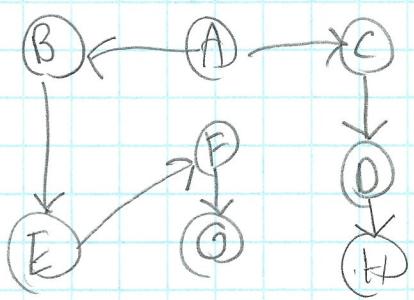
marked []	T T T
edgeTo []	- A A
	T T T
	B E F

Depth First Search Directed Graph

2a



A	B	C	D	E	F	G	H
marked []	T	T	T	T	T	T	T
edgeTo []	-	A	A	C	B	E	F

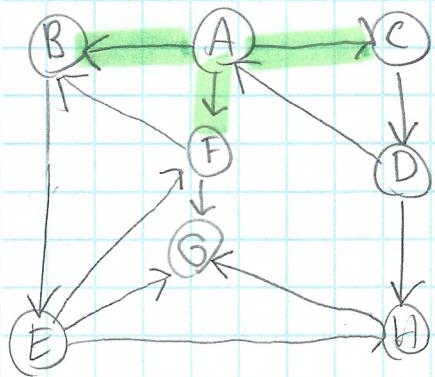


A	B	C	D	E	F	G	H
marked []	T	T	T	T	T	T	T
edgeTo []	-	A	A	C	B	E	F

Breadth First Search Directed Graph

* From A

(2a)



	Que	edge	Dist
A	A	-	0
B			
C			
D			
E			
F			
G			
H			

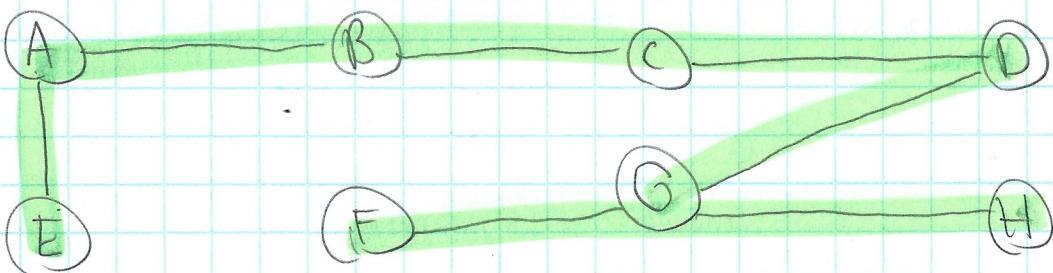
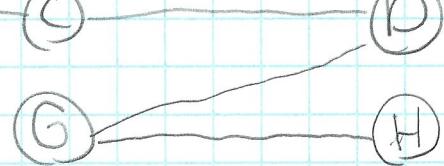
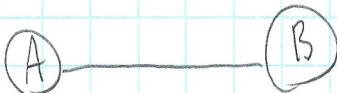
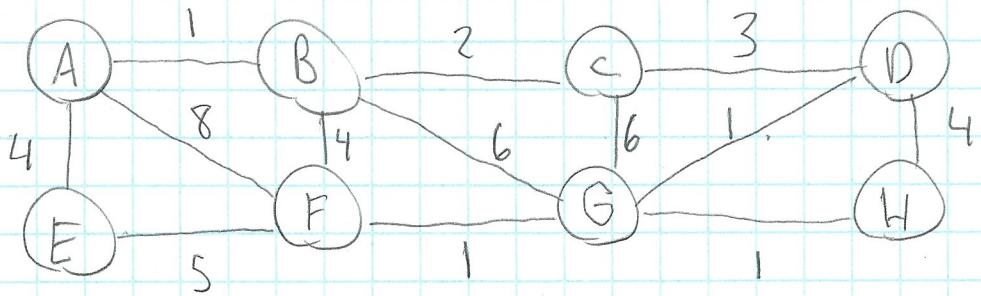
A	T	B	-	0
B	C	C		
C	D	D		
D	E	E		
E	F	F		
F				
G				
H				

A	E	B	-	0
B	D	C	A	1
C	G	A		1
D				
E				
F				
G				
H				

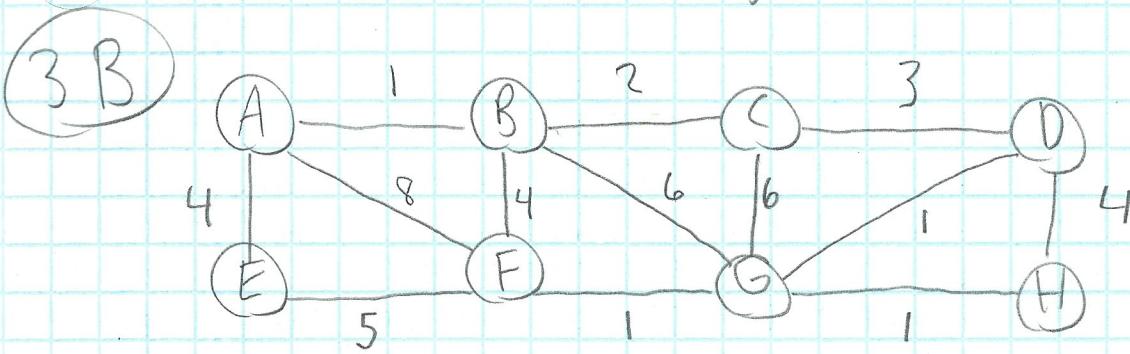
A	F	B	-	0
B	G	A	A	1
C	H			1
D				
E				
F				
G				
H				

Prim's Algorithm

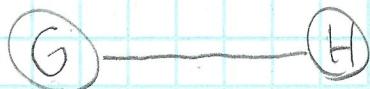
3a



Kruskal's Algorithm



`d[] = 0 1 2 3 4 5 7 7`



`d[] = 0 1 2 3 4 7 7 7`



`d[] = 1 1 2 3 4 7 7 7`



`d[] = 1 1 2 3 4 3 3 3`



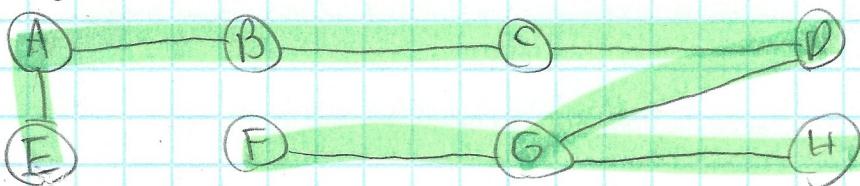
`d[] = 2 2 2 3 4 3 3 3`



`d[] = 3 3 3 3 4 3 3 3`



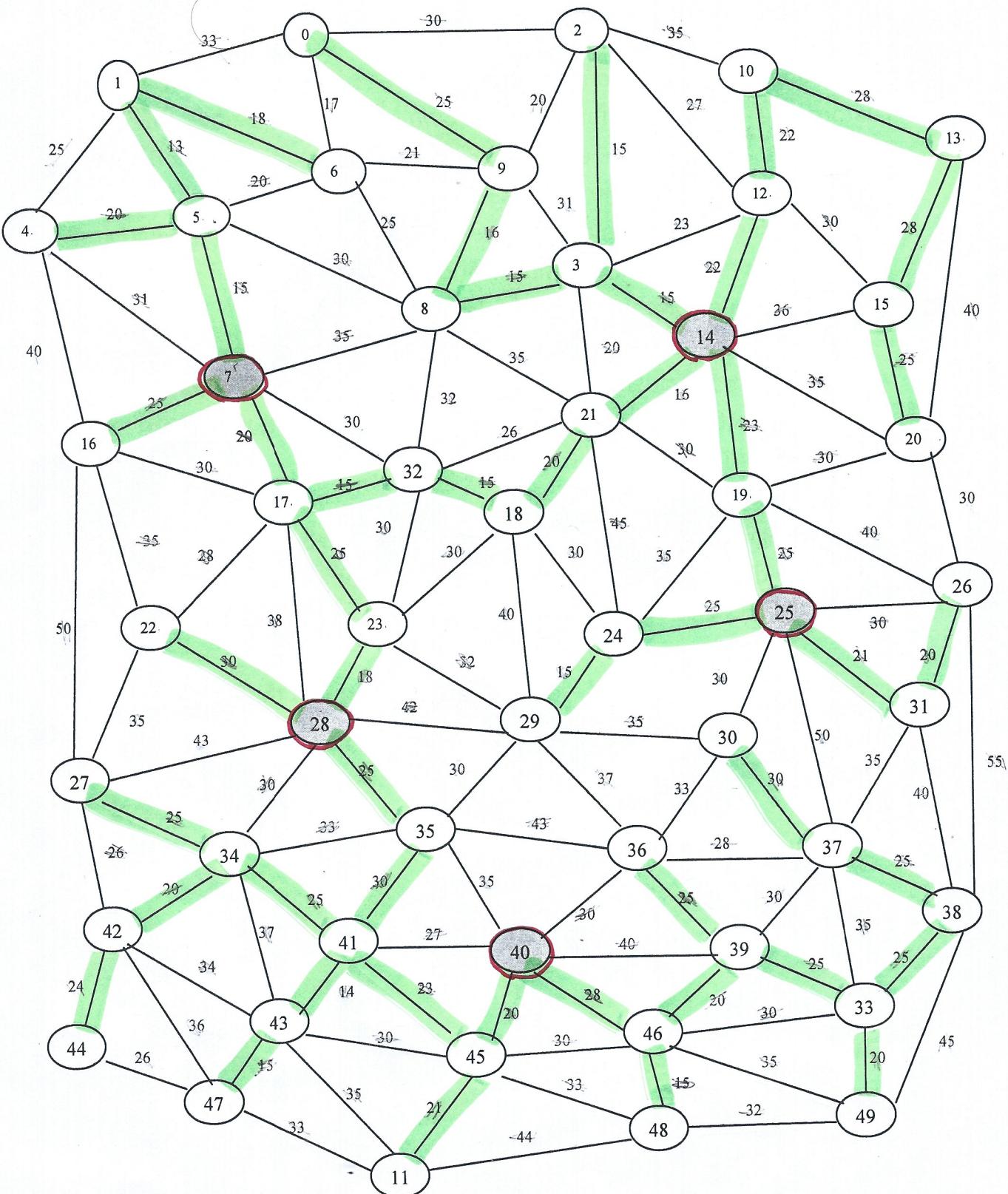
`d[] = 4 4 4 4 4 4 4 4`



3c

Total Cable needed is 1,032 units.

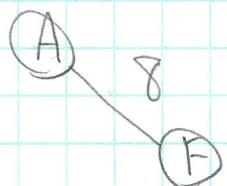
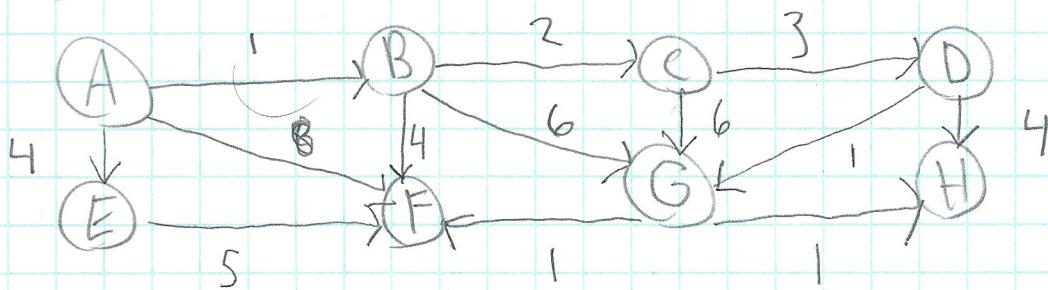
Min Span Tree



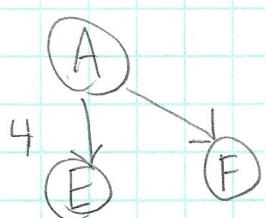
MST

4a

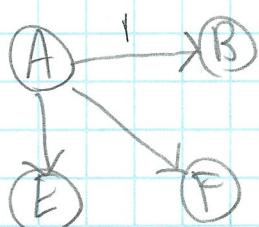
Dijkstra's Algorithm



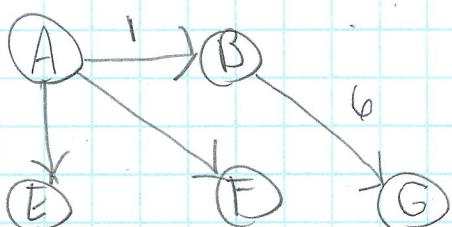
$$8 = \text{dist}$$



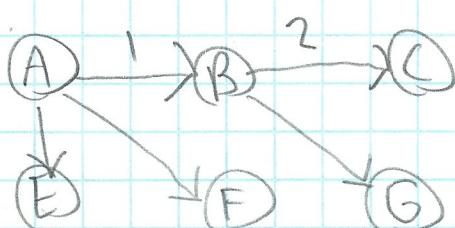
$$4 = \text{dist}$$



$$1 = \text{dist}$$



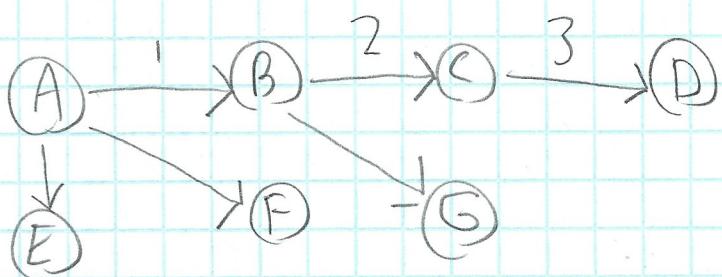
$$7 = \text{dist}$$



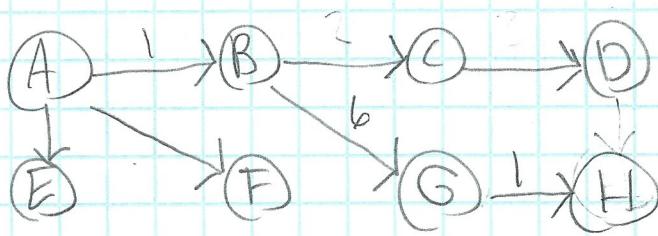
$$3 = \text{dist}$$

4 a

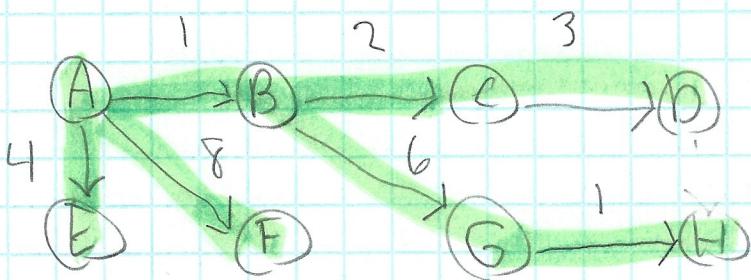
Dijkstra's



$g = \text{dist}$

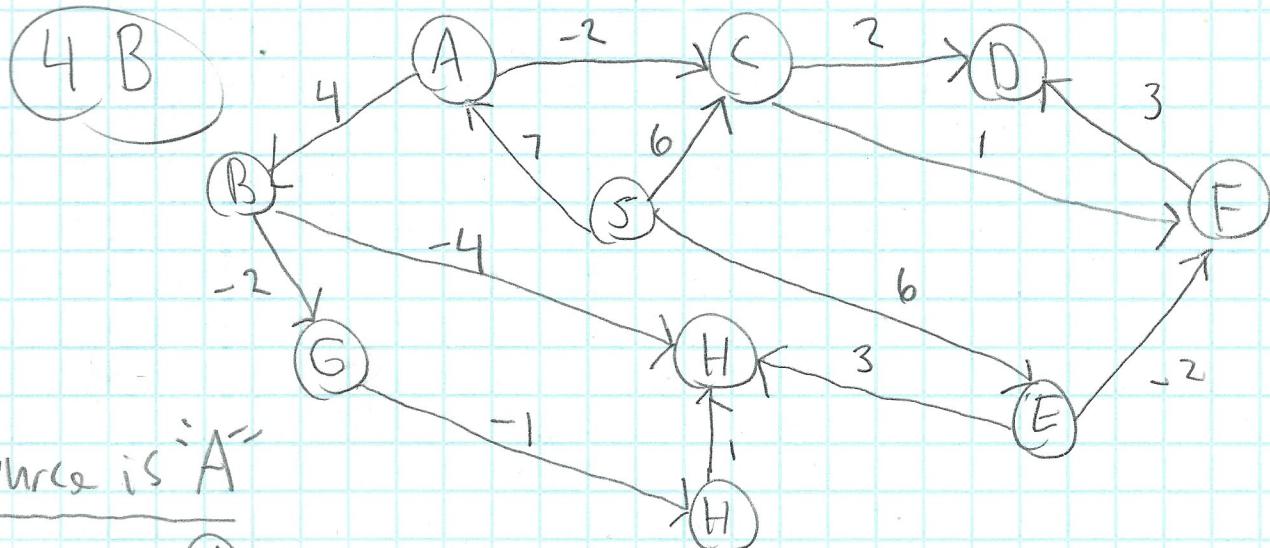


$\text{dist} = 8$

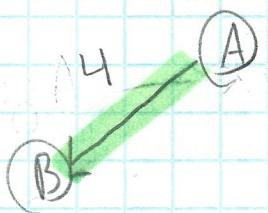


total cost = 25

Bellman Ford

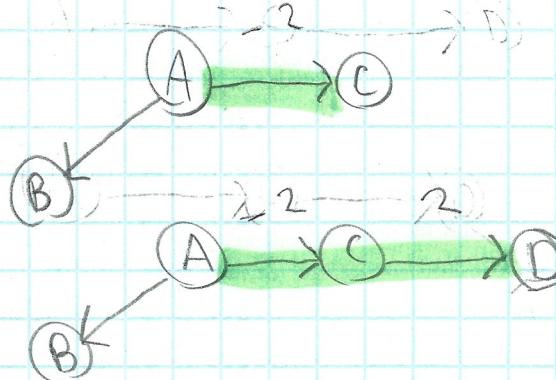


Source is "A"

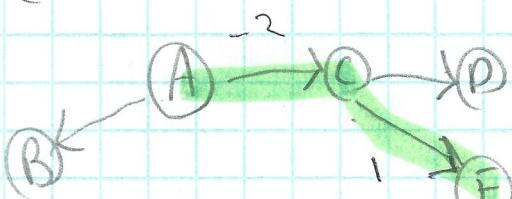


Distance 4

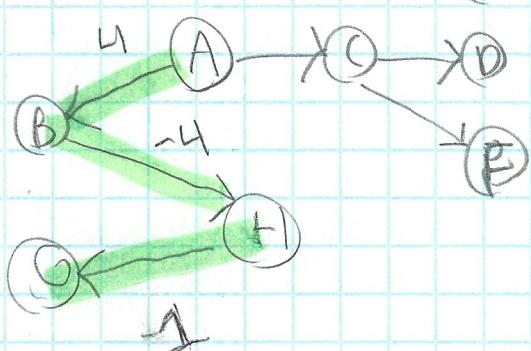
-2 = distance



-1 0

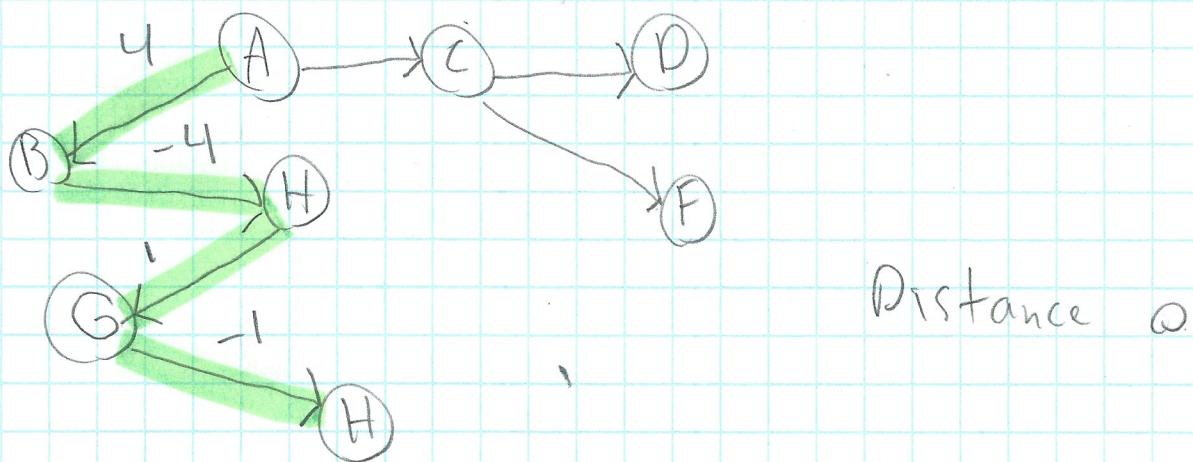
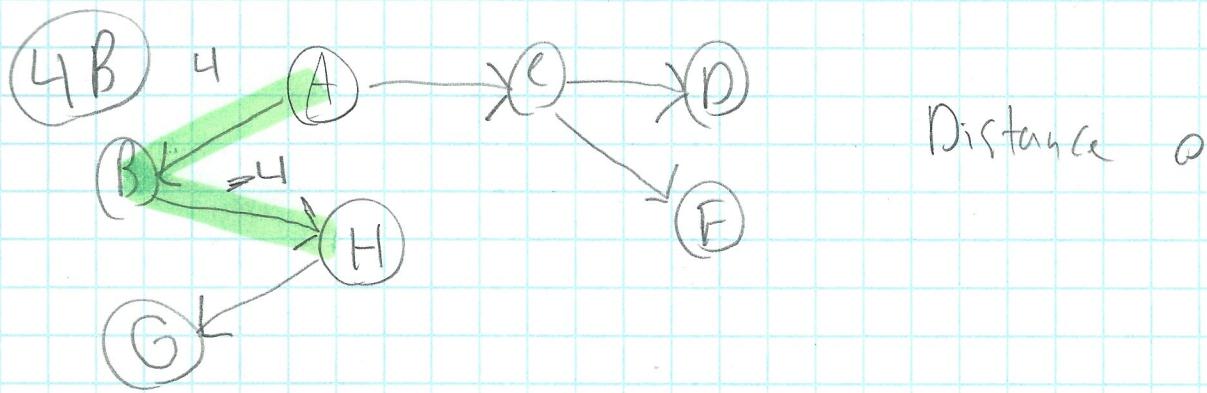


-1 = distance



1 = distance

Bellman Ford



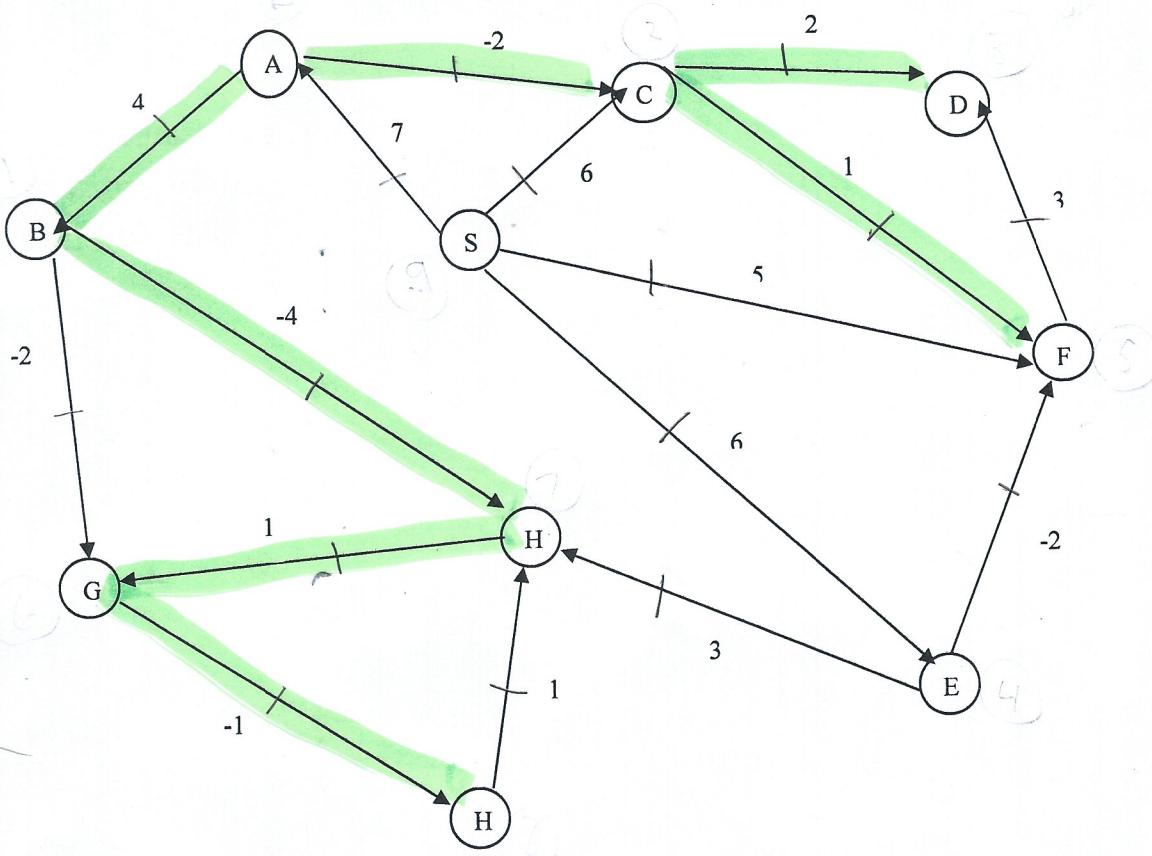
nodes $\textcircled{5}$ and \textcircled{E}

are not reachable from

source node \textcircled{A}

5c

(4b)



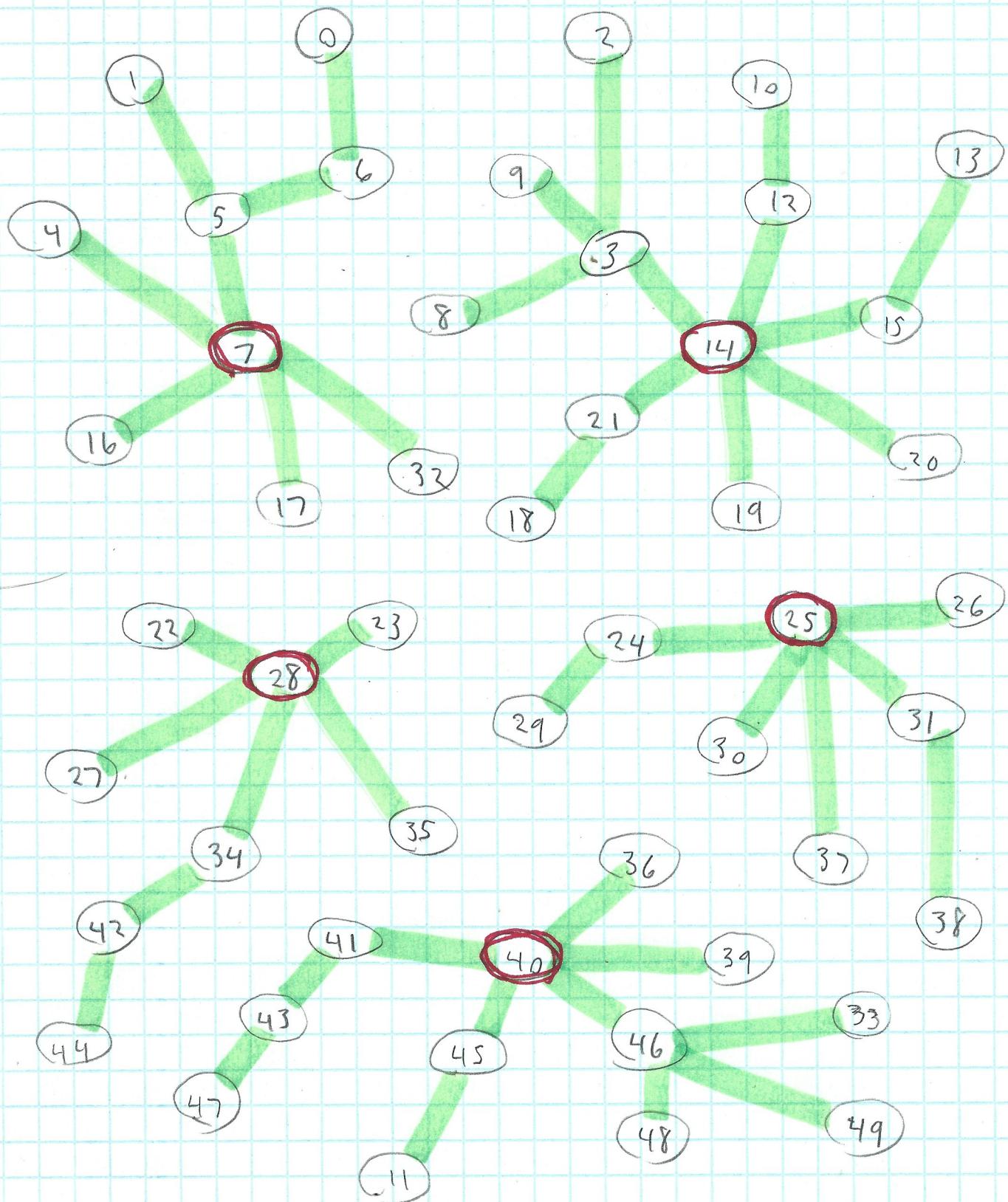
c) Shortest Path on DAG

Find the shortest cost path from vertex A to all other vertices for the following vertex. Show the intermediate steps and cost at each iteration of the algorithm, and show the final shortest path tree and cost.

EX 4D

(Programming)

Shortest Travel Times



★ 5 Partial Bellman Ford Trees

EX 4D

If I could only build 1 field station
it would be station #14.

Total weights of cable from:

Station 7: 1,328

Station 14: 1,270

Station 28: 1,276

Station 25: 1,271

Station 40: 1,266