

Assignment 6

1.) Count # of pairs $O(n)$

CountPairs(A, n):

Input: Array A of size n

Output: # of pairs

// initialize hash map ~~to store freq of each elem~~

freq-map \leftarrow empty hash map

// Populate hm w/ freqs of elems in A

for i $\leftarrow 1$ to n

if A[i] exists in freq-map

freq-map[A[i]] \leftarrow freq-map[A[i]] + 1

else

freq-map[A[i]] \leftarrow 1

// count valid pairs

pair-count \leftarrow 0

for key in freq-map.keys()

if (key + 1) exists in freq-map

pair-count \leftarrow pair-count + (freq-map[key]

freq-map[key + 1])

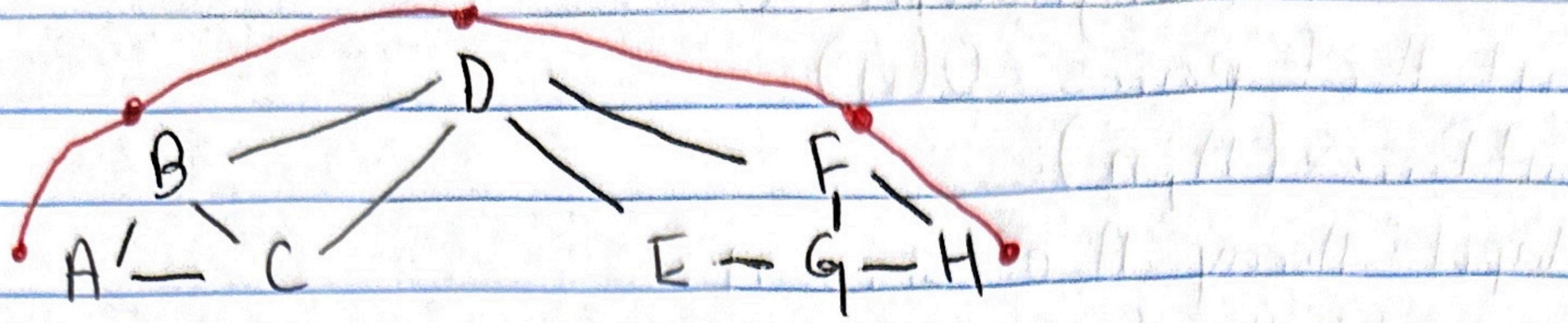
return pair-count

// for each unique key, check if key + 1 exists

// if exists, add product of freqs to pair-count

// $O(n)$ because it's just iterating through array once

2.)



(a) A: B, C

B: A, C, D

C: A, B, D

D: B, C, E, F

E: D, G

F: D, G, H

G: E, F, H

H: F, G

(B) A, B, D, F, H

(c) A → B: Tree edge

B → D: tree edge

D → F: tree edge

F → H: tree edge

B → C: back edge

C → D: back edge

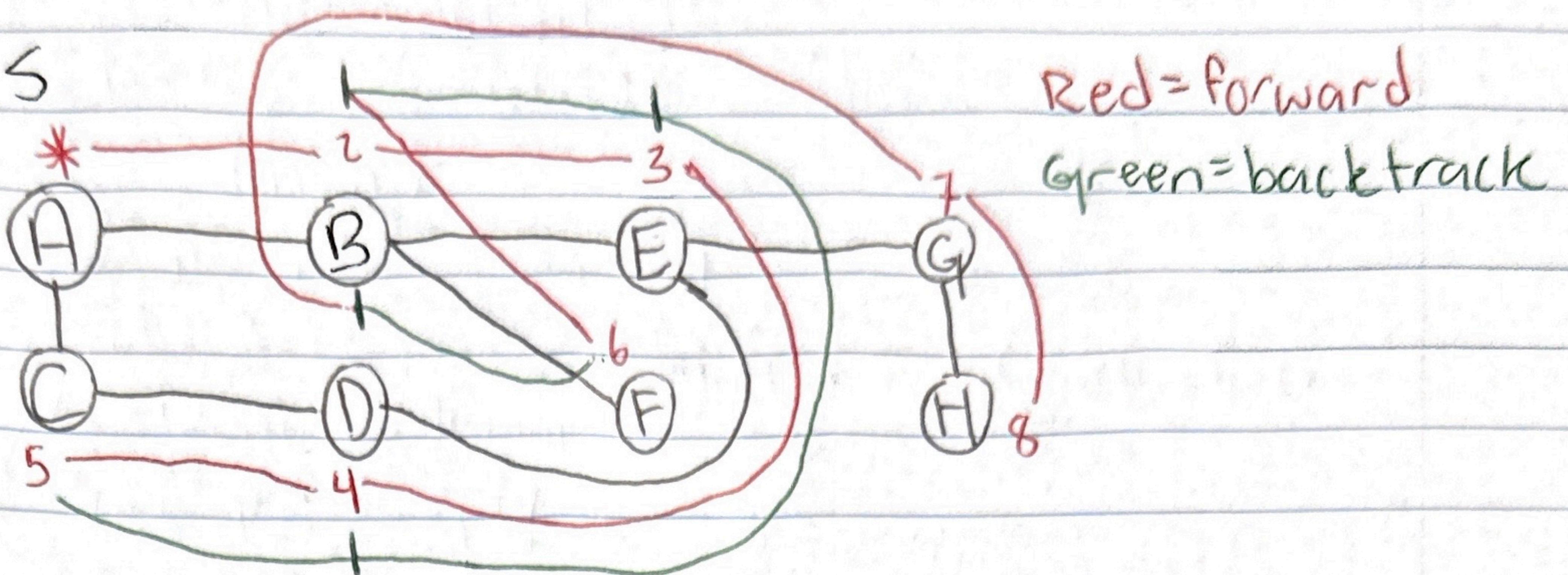
D → E: tree edge

E → G: tree edge

G → F: back edge

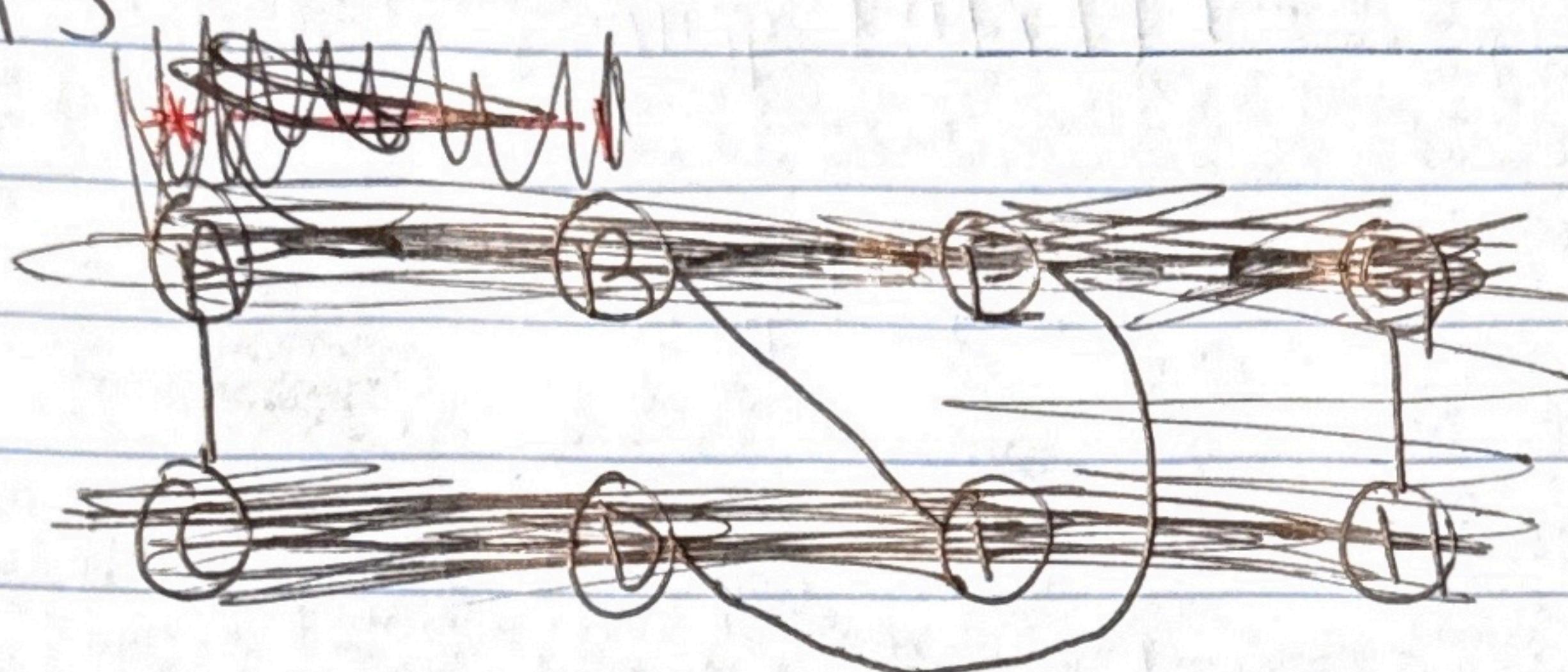
G → H: back edge

3.) DFS



$A \rightarrow B \rightarrow E \rightarrow F \rightarrow G \rightarrow H$

BFS



* Queue: [B, C]

1: Queue: [C, E, F]

1) Start at A

Queue: [B, C]

7) Dequeue G

Queue: [H]

2) Dequeue B

Queue: [C, E, F]

8) Dequeue H

Queue: []

3) Dequeue C

Queue: [E, F, D]

$A \rightarrow B \rightarrow C \rightarrow E \rightarrow F \rightarrow D \rightarrow G \rightarrow H$

4) Dequeue E

Queue: [F, D, G]

5) Dequeue F

Queue: [D, G]

6) Dequeue D

Queue: [G]

Assignment 6
Question 4

1) Kruskal's Algorithm

Order	Edge	Weight	Action
1	(v1, v2)	1	Accept
2	(v2, v6)	1	Accept
3	(v2, v4)	2	Accept
4	(v1, v4)	3	Reject
5	(v2, v5)	3	Accept
6	(v2, v3)	3	Accept
7	(v4, v6)	3	Reject
8	(v5, v6)	3	Reject
9	(v3, v6)	6	Reject
10	(v4, v5)	12	Reject

2) Prim's Algorithm

Order	Edge	Weight
1	(v4, v2)	2
2	(v2, v6)	1
3	(v2, v1)	1
4	(v2, v5)	3
5	(v6, v3)	6
6	(v4, v1)	3
7	(v6, v5)	3
8	(v5, v4)	12
9	(v4, v6)	3
10	(v3, v6)	6

3.) $1+1+2+3+3=10$

Weight of MST = 10