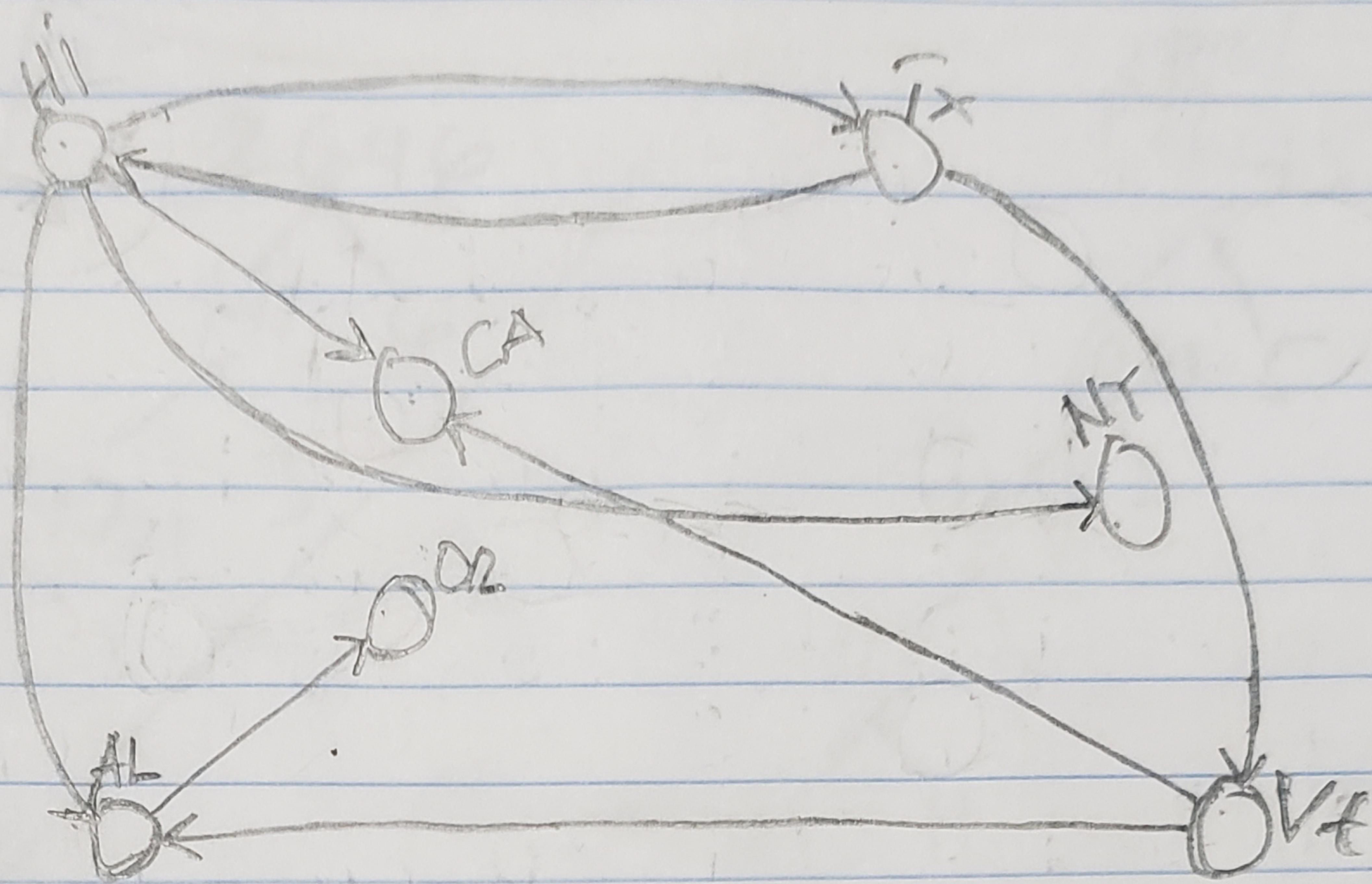


1. Draw the state graph



2. Describe the graph pictured above, using the formal graph notation.

$$V(\text{StateGraph}) = \{\text{Oregon}, \text{Texas}, \text{Alaska}, \text{Hawaii}, \text{Vermont}, \text{New York}, \text{California}\}$$

$$E(\text{stateGraph}) = \{(\text{Hawaii}, \text{Alaska}), (\text{Hawaii}, \text{California}), (\text{Hawaii}, \text{Texas}), (\text{Vermont}, \text{California}), (\text{Texas}, \text{Hawaii}), (\text{Hawaii}, \text{New York}), (\text{Texas}, \text{Vermont}), (\text{Alaska}, \text{Oregon}), (\text{Vermont}, \text{Alaska})\}$$

2a Is there a path from Oregon to any other state in the graph? NO

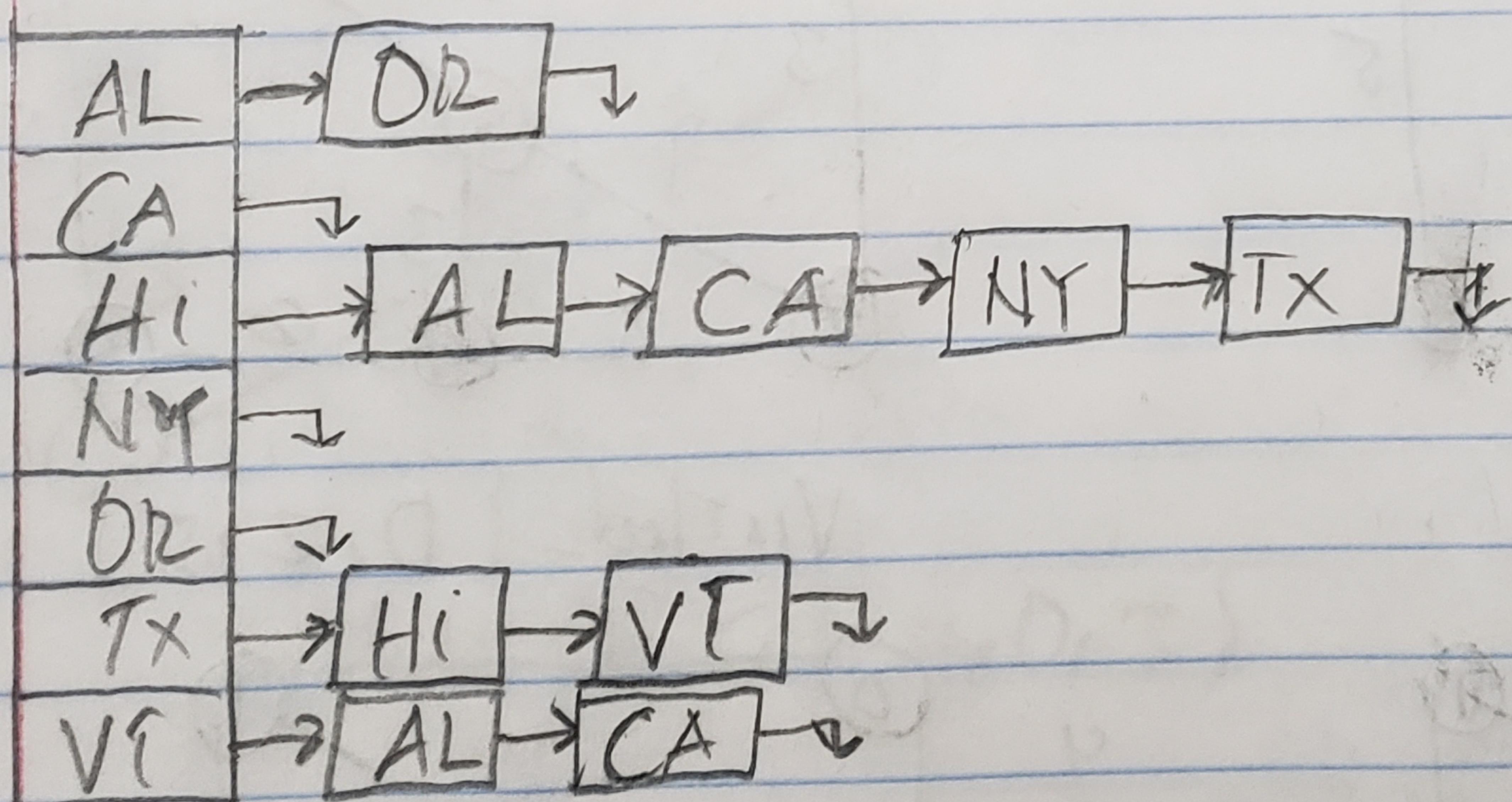
b. Is there a path from Hawaii to every other state in the graph? YES

c. From which state(s) in the graph is there a path to Hawaii? Hawaii

- 3a. Show the adjacency matrix that would describe the edges in the graph. Store the vertices in alphabetical order.

States	AL	CA	HI	NY	OR	TX	VT
AL	0	0	0	0	1	0	0
CA	0	0	0	0	0	0	0
HI	1	1	0	1	0	1	0
NY	0	0	0	0	0	0	0
OR	0	0	0	0	0	0	0
TX	0	0	1	0	0	0	1
VT	1	1	0	0	0	0	0

- 3b. Show the adjacency lists that would describe the edges in the graphs.



- 4a. Which of the following list of graph nodes in depth first order beginning with E?

(C) E, G, A, D, F, C, B

- 4b. Which of the following list the graph nodes in breadth first order beginning with F?

(A) F, C, D, A, B, E, G

5

Find the shortest distance from Atlanta to every other city.

$$\text{Atlanta} \rightarrow \text{Houston} = 800$$

$$\text{Atlanta} \rightarrow \text{Washington} = 600$$

$$\text{Atlanta} \rightarrow \text{Dallas} = 1900$$

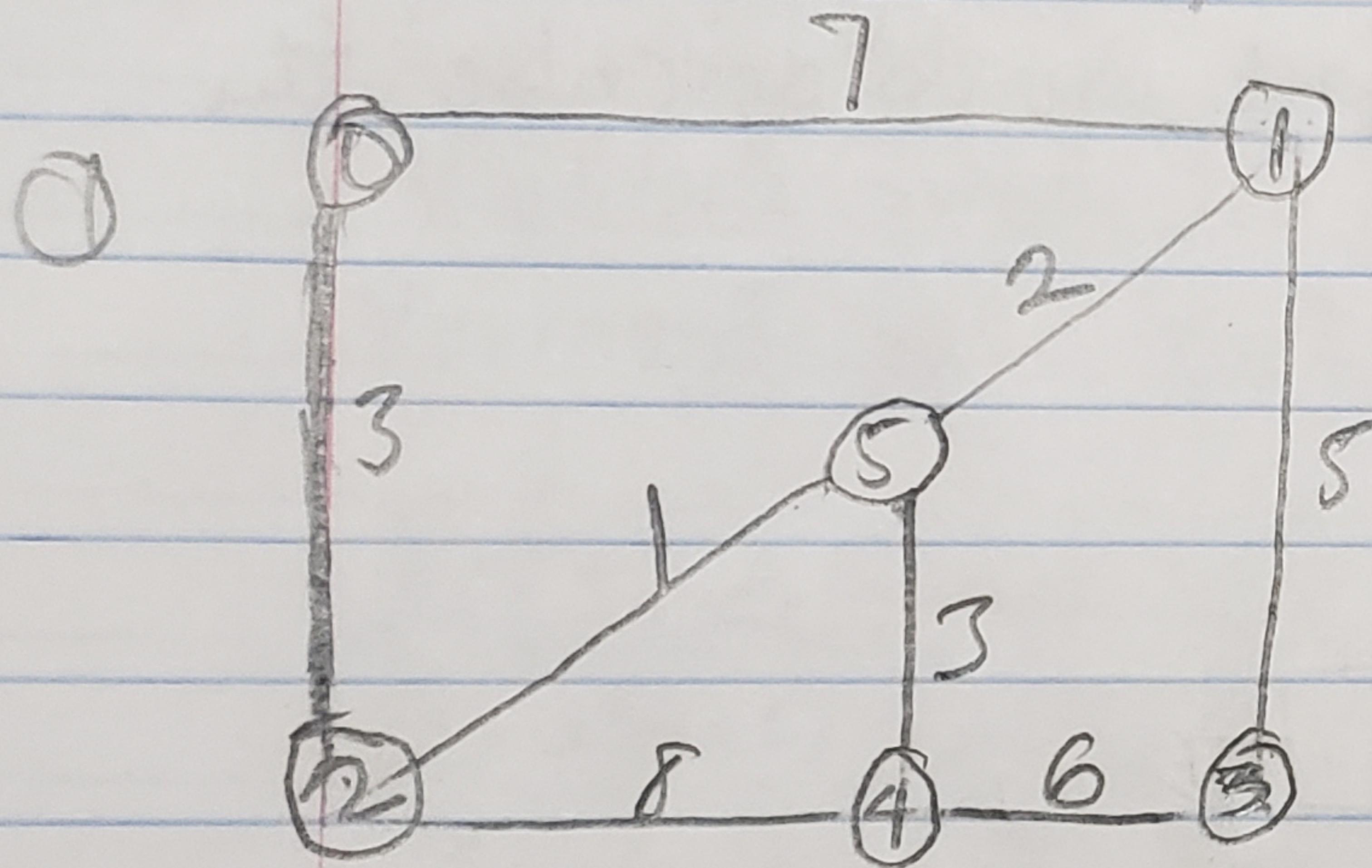
$$\text{Atlanta} \rightarrow \text{Austin} = 2100$$

$$\text{Atlanta} \rightarrow \text{Denver} = 2680$$

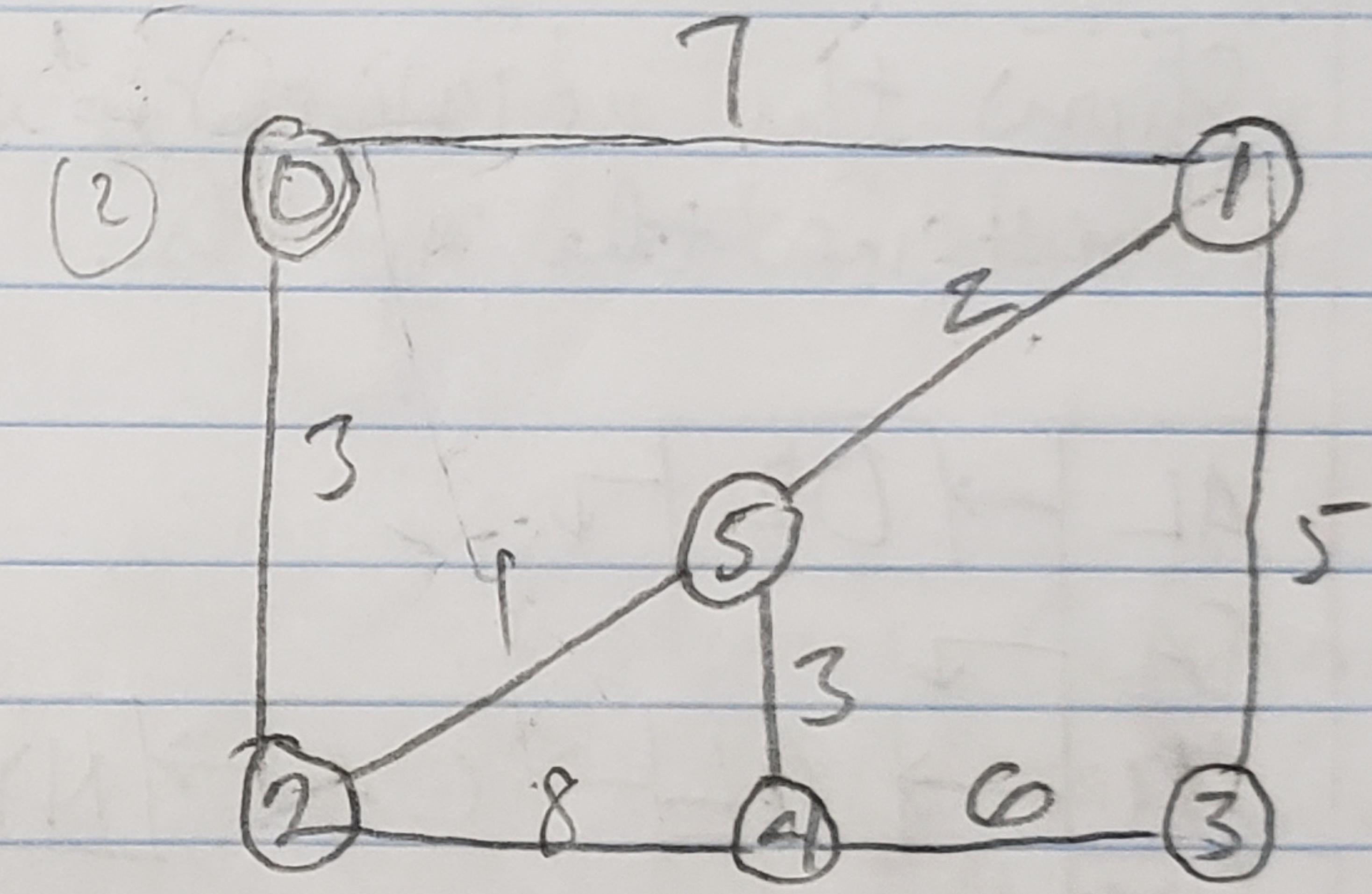
$$\text{Atlanta} \rightarrow \text{Chicago} = 2800$$

(6)

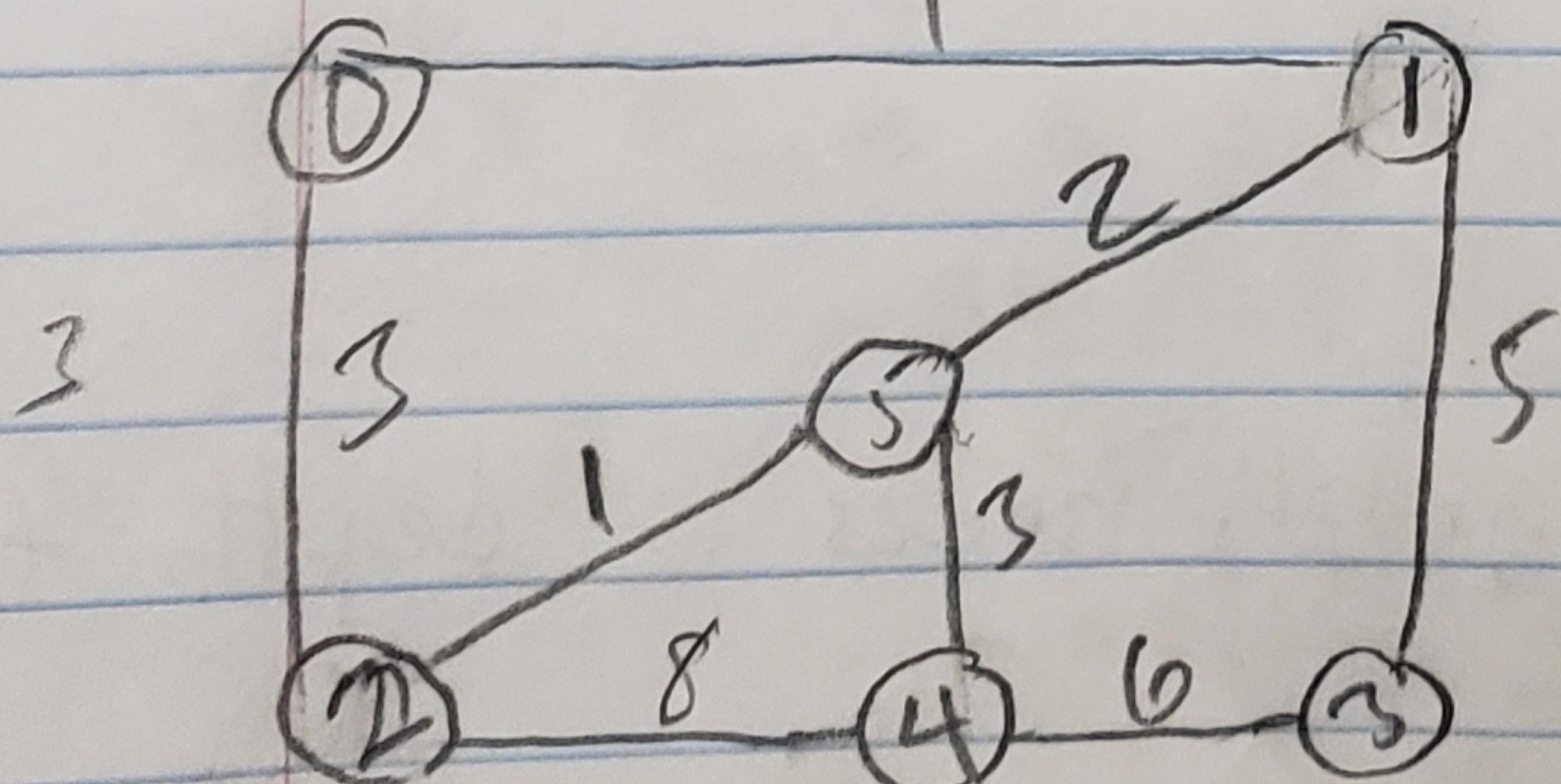
Find the minimal spanning tree using prims' algorithm. Use 0 as the source vertex. Show the steps.



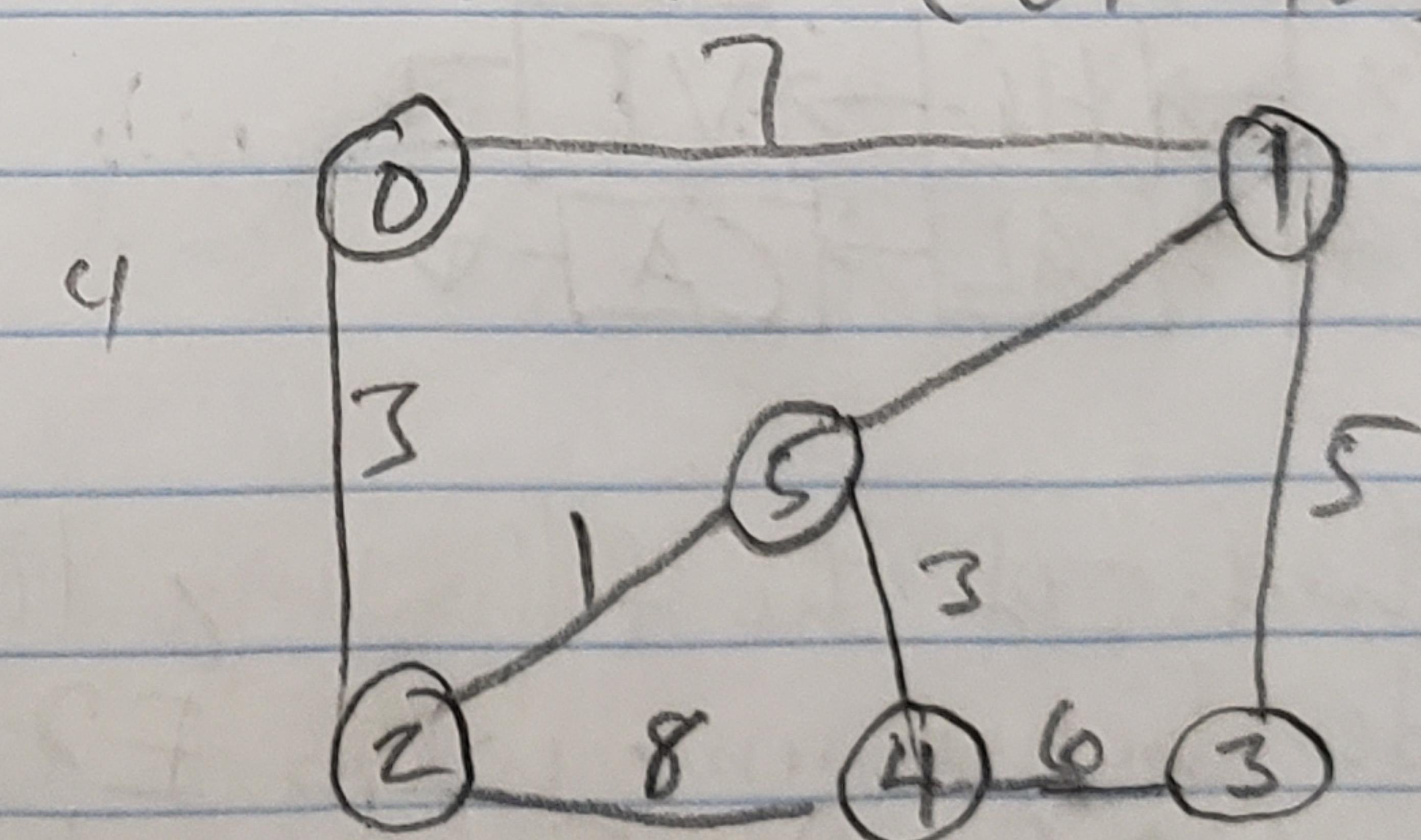
$$\text{Visited} = \{0, 2\}$$



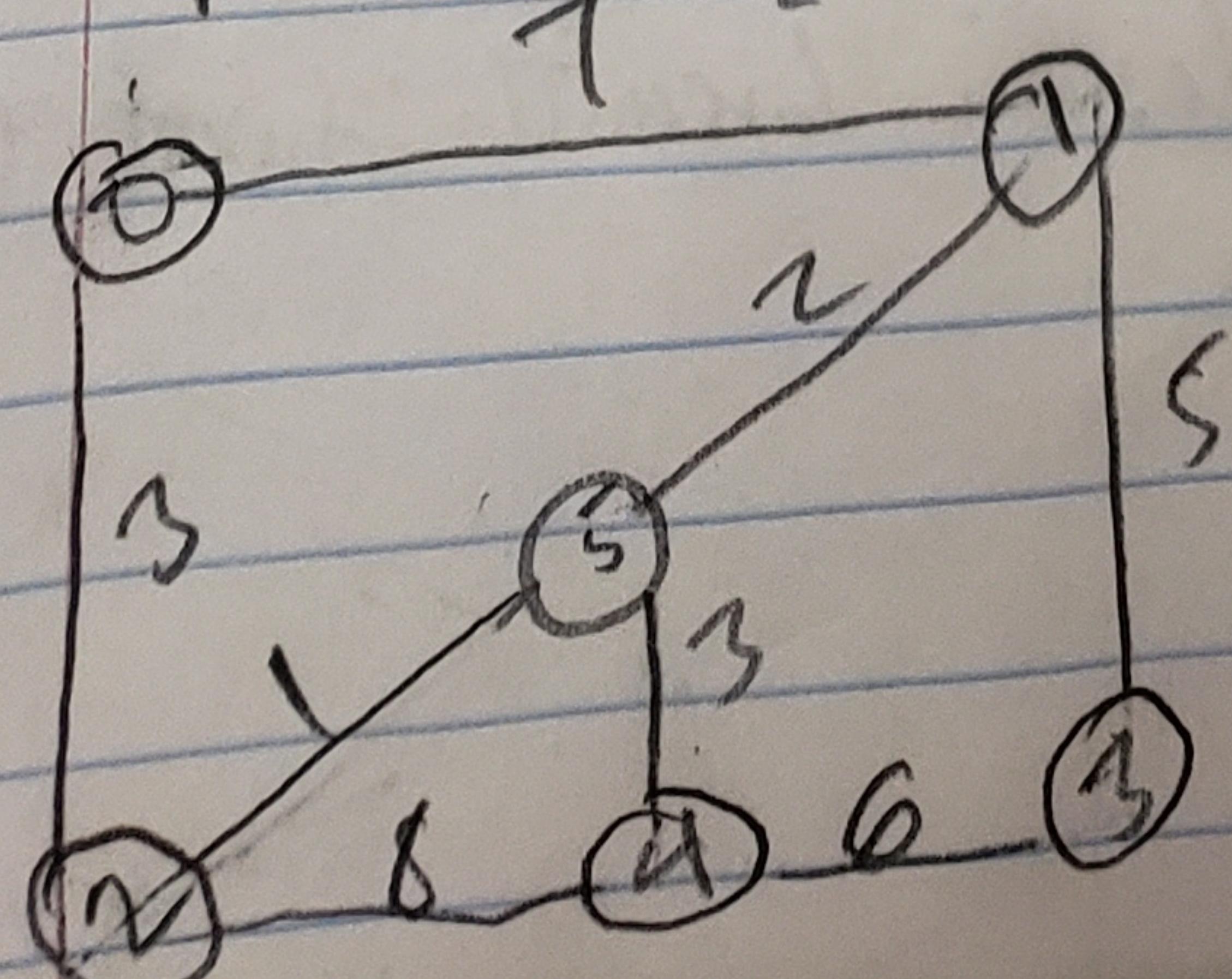
$$\text{Visited} = \{0, 2, 5\}$$



$$\text{Visited} = \{0, 2, 5, 1\}$$

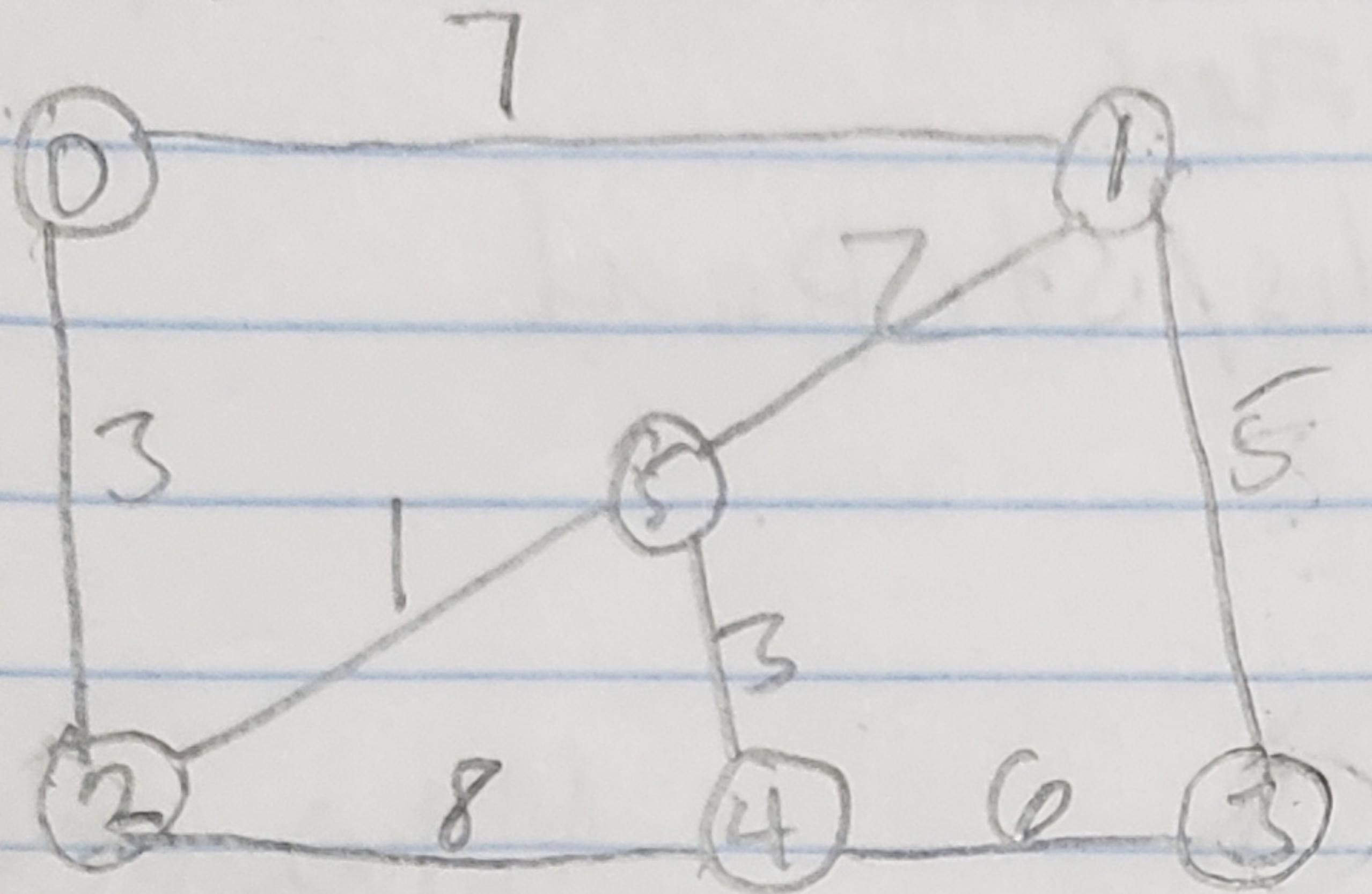


$$\text{Visited} = \{0, 2, 5, 1, 4\}$$

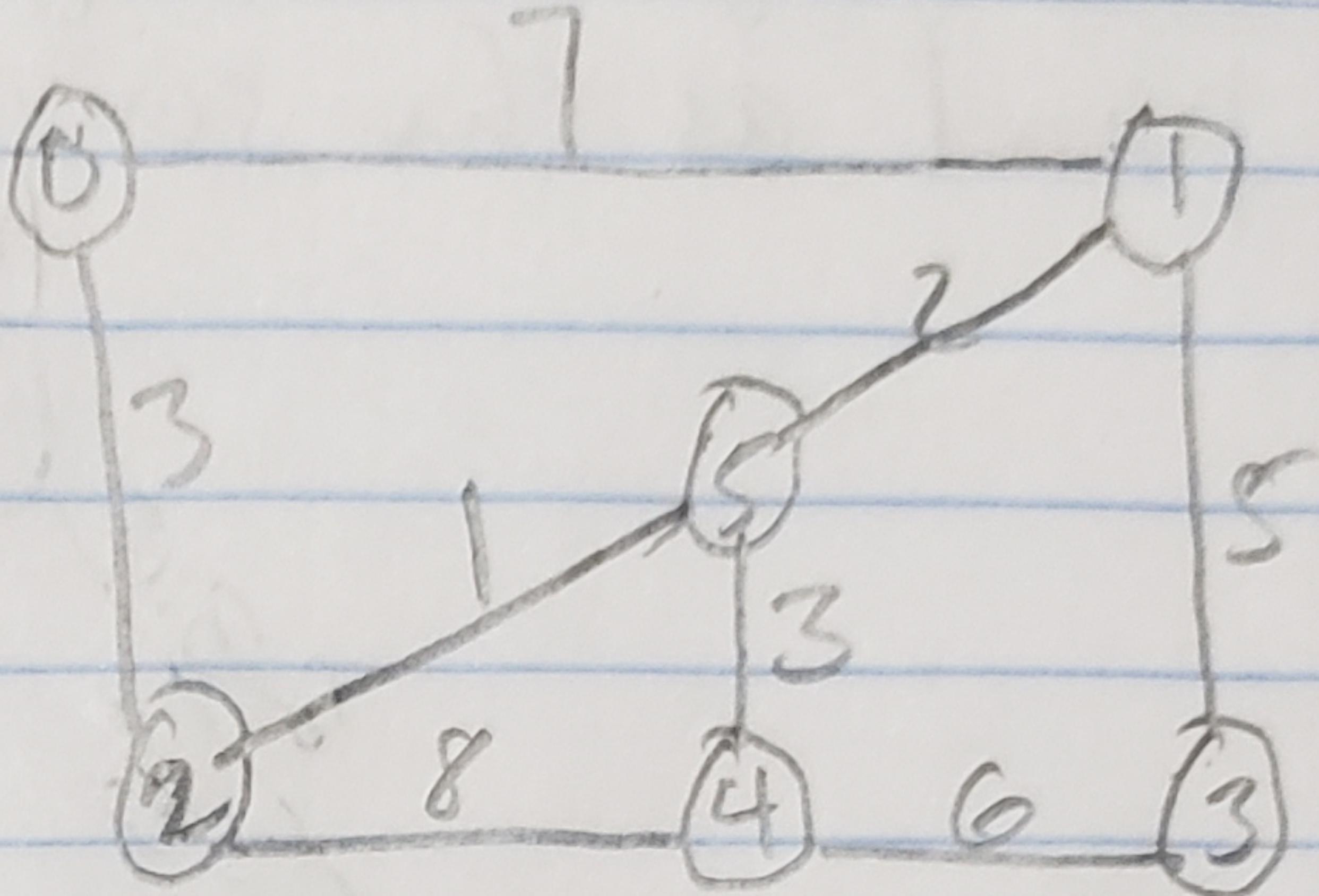


$$\text{Visited} = \{0, 2, 5, 1, 4, 3\}$$

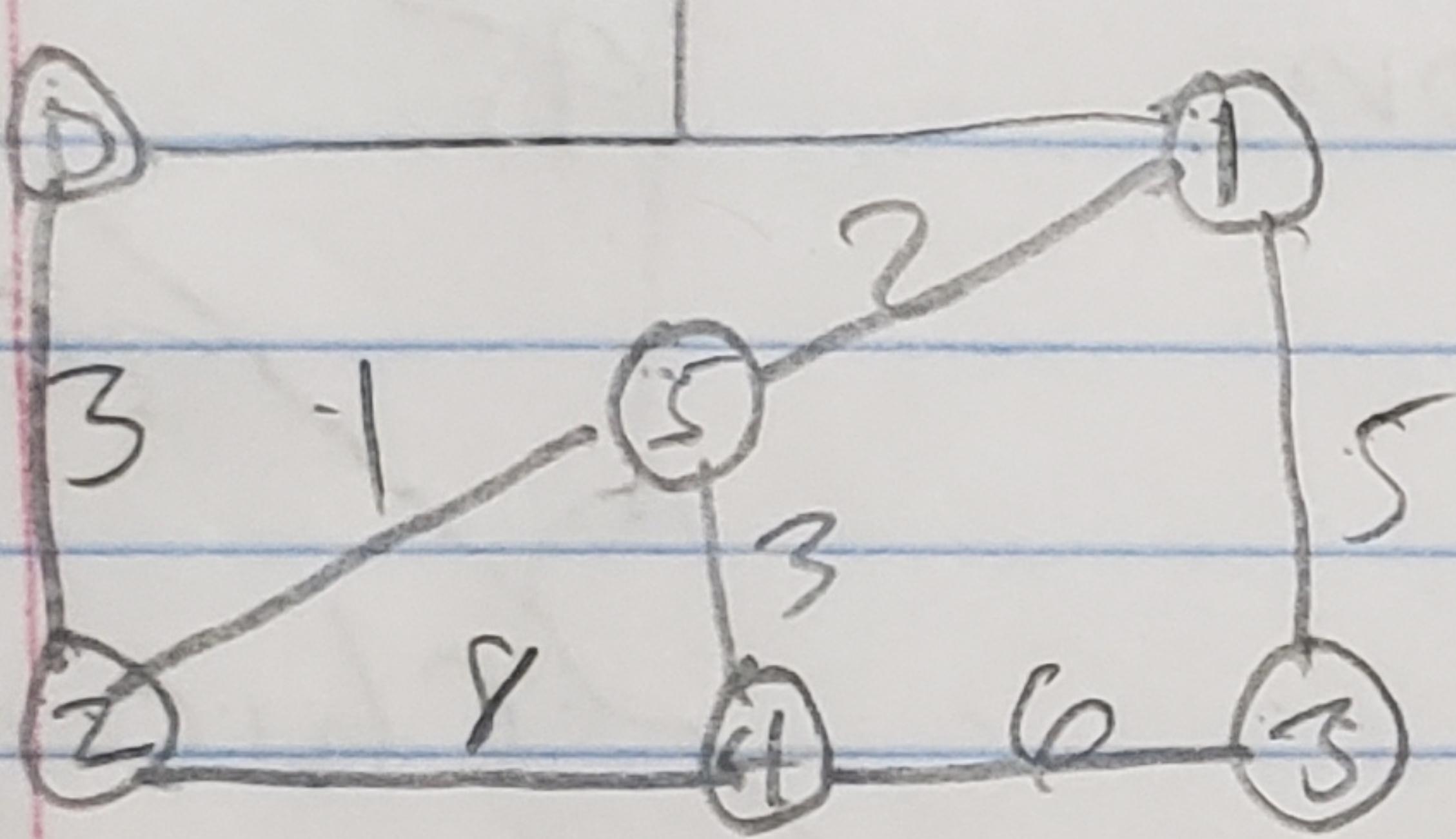
⑦ Find the minimal spanning tree using kruskal's algorithm. Show the weights in order and the steps.



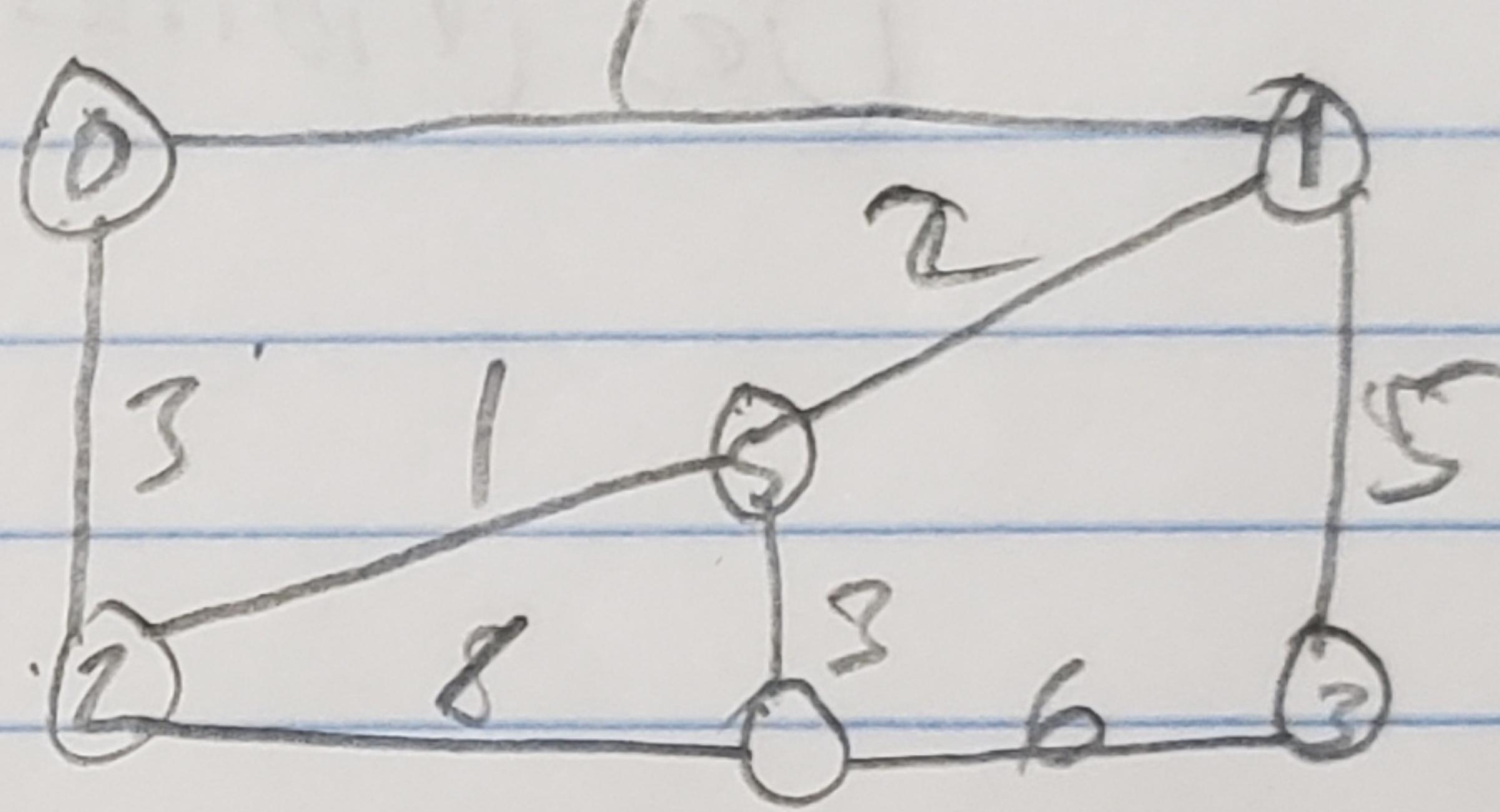
Visited = {2, 5}



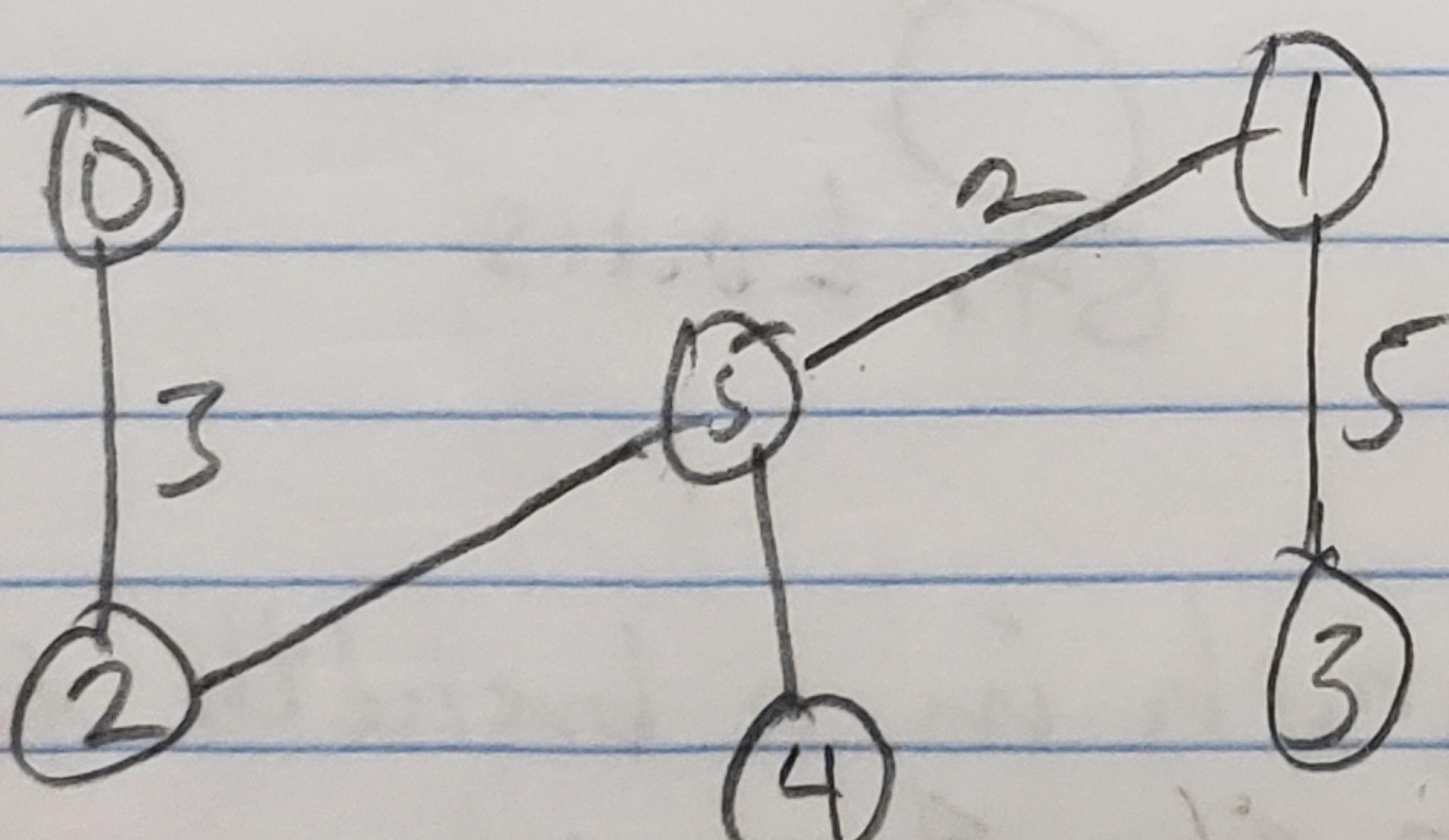
Visited = {2, 5, 1}



Visited = {2, 5, 1, 4}

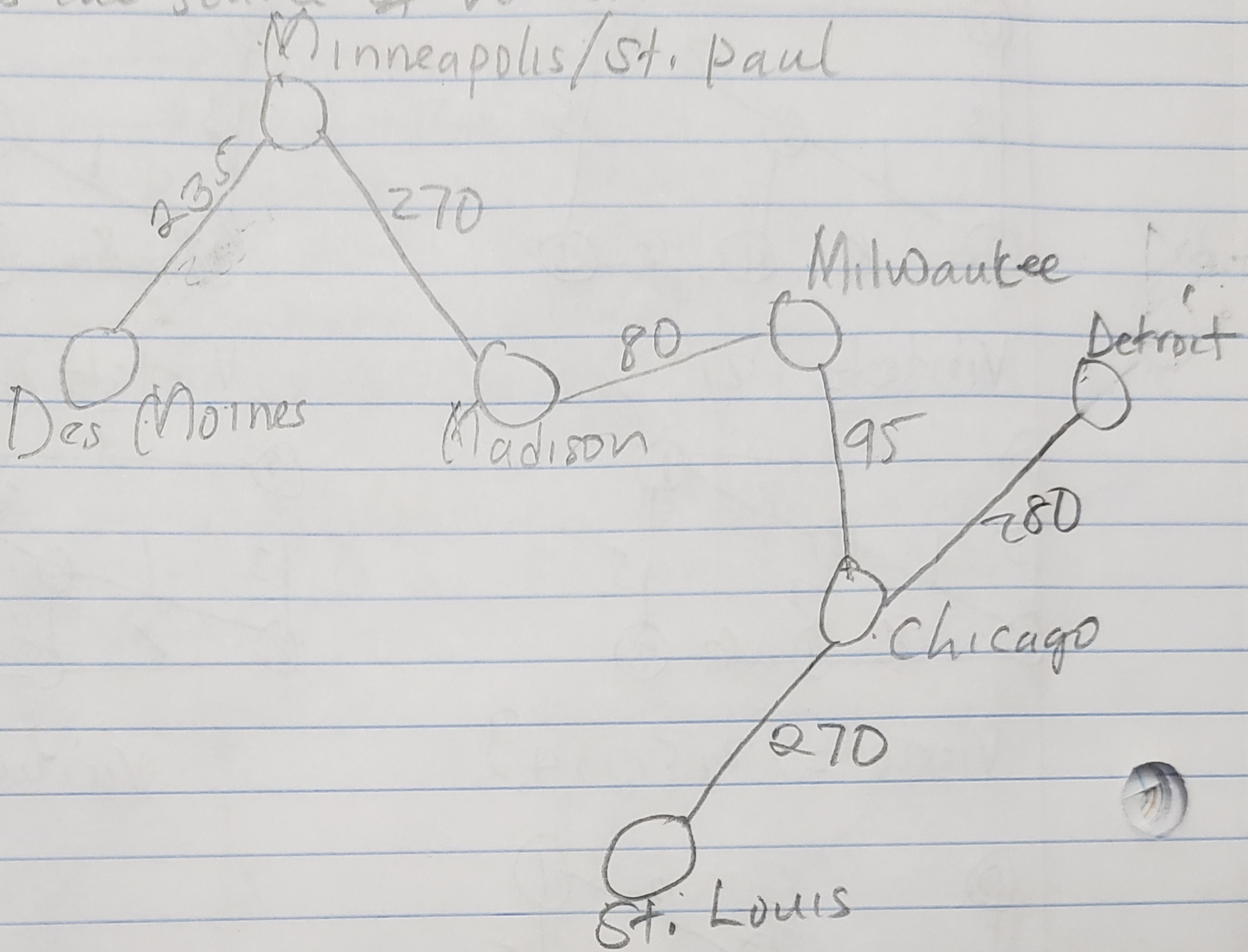


Visited = {2, 5, 1, 4, 0}



Visited = {2, 5, 1, 4, 0, 3}

- (8) Find the minimal spanning tree using the algorithm you prefer. Use Minneapolis/St. Paul as the source of vertex.



- (9) List the nodes of the graph in a breadth first topological ordering. Show the steps using arrays preCount, topologicalOrder and a queue.

topological: 0, 5, 1, 8, 6, 3, 2, 4, 9, 7

- (10) List the nodes of the graph in a breadth first topological ordering.

topological ordering: start, programming1, Discrete Maths, Computer Organization, programming2, operating systems, High Level Languages, Algorithms, senior seminar, Theory of Computation, end.