Algorithms

FOURTH EDITION

ROBERT SEDGEWICK | KEVIN WAYNE

http://algs4.cs.princeton.edu

4.1 DEPTH-FIRST SEARCH
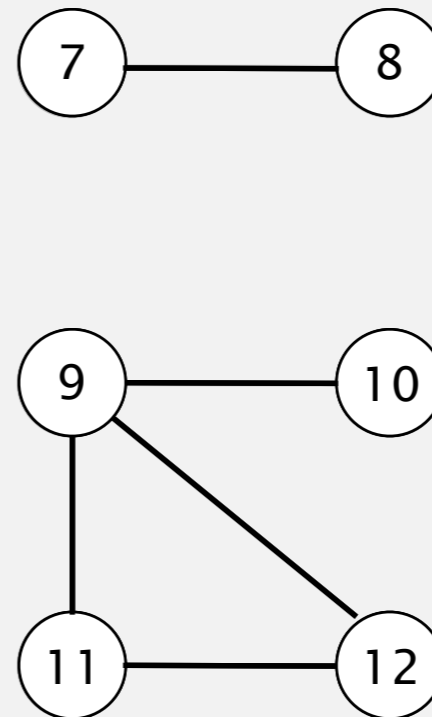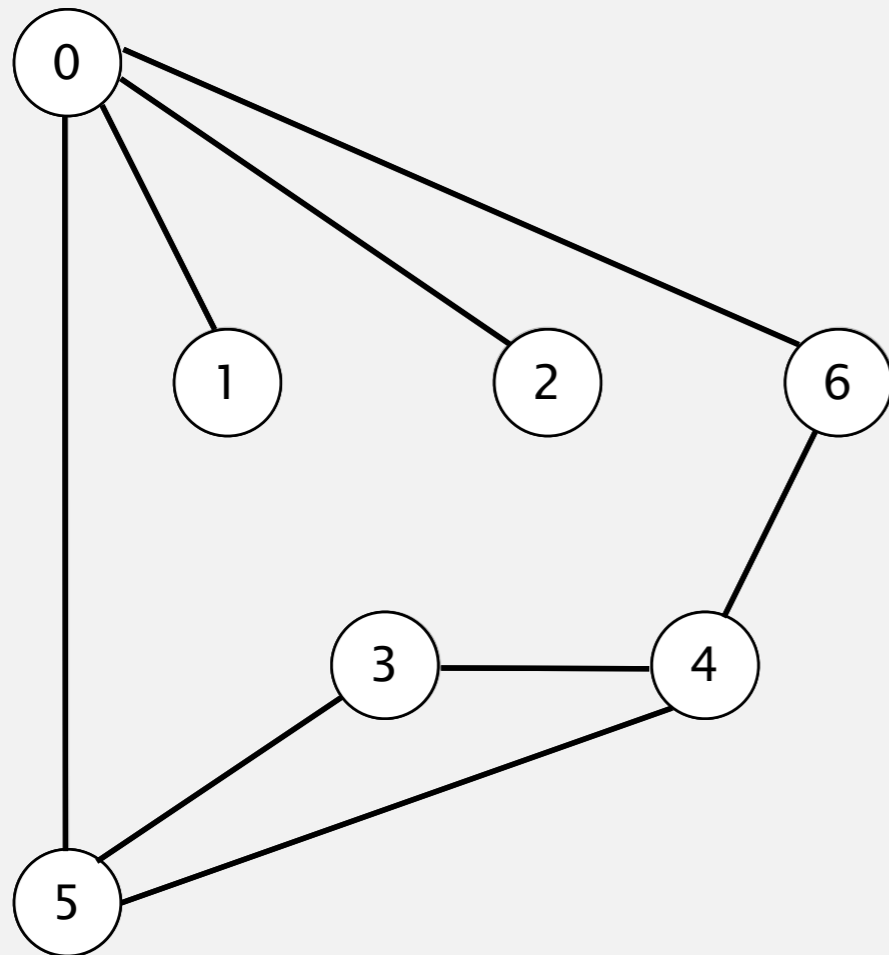
Depth-first search demo

To visit a vertex v :

- Mark vertex v as visited.

- Recursively visit all unmarked vertices adjacent to v.
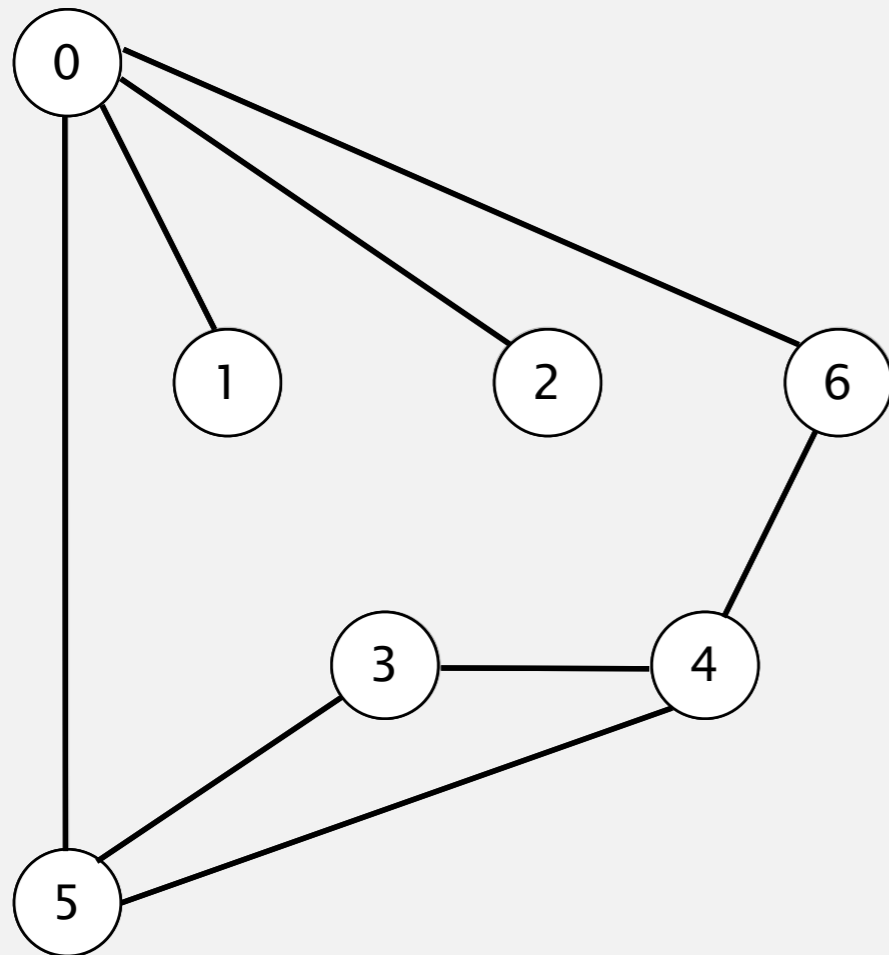

graph G

Depth-first search demo
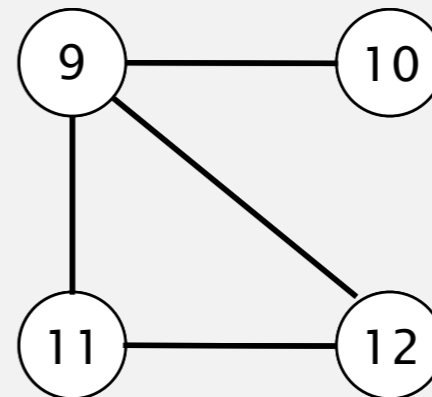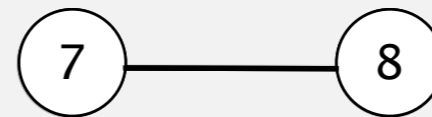
To visit a vertex v :

- Mark vertex v as visited.

- Recursively visit all unmarked vertices adjacent to v.

graph G

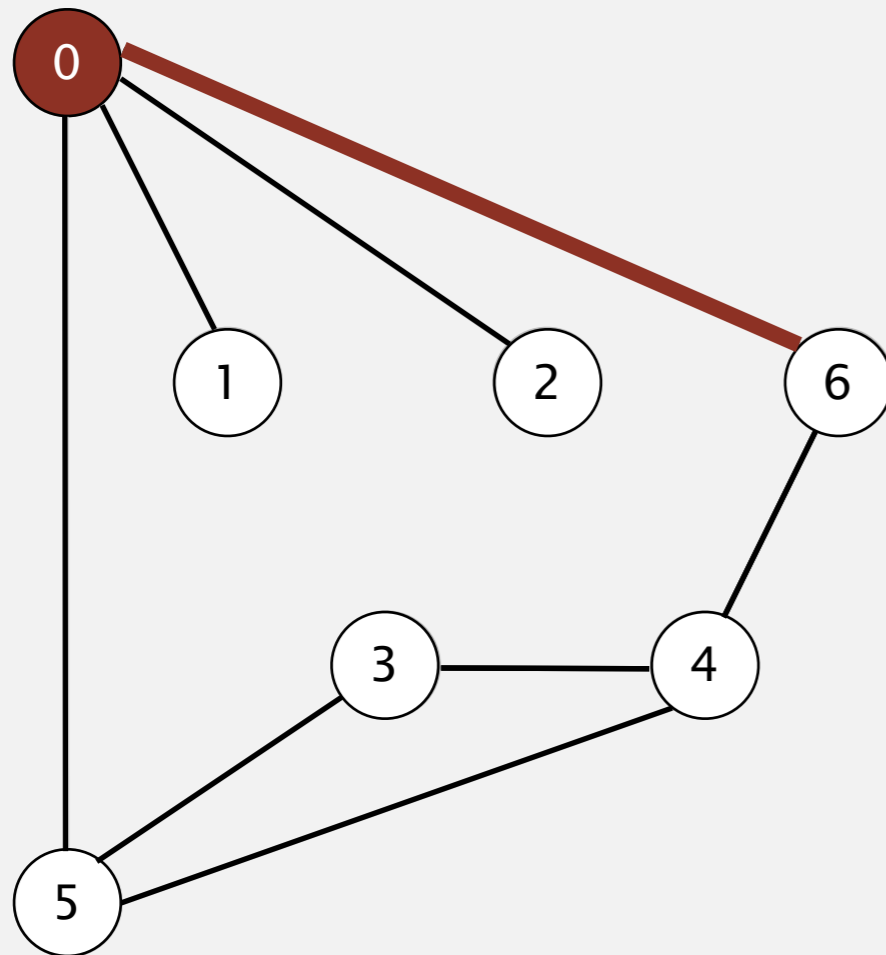| v	marked[]	edgeTo[]
0	F	–
1	F	–
2	F	–
3	F	–
4	F	–
5	F	–
6	F	–
7	F	–
8	F	–
9	F	–
10	F	–
11	F	–
12	F	–

Depth-first search demo

To visit a vertex *v* :

- Mark vertex *v* as visited.
- Recursively visit all unmarked vertices adjacent to *v*.

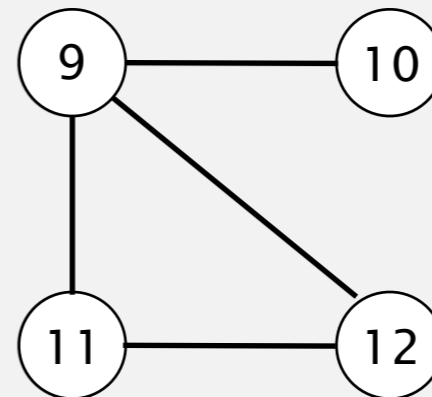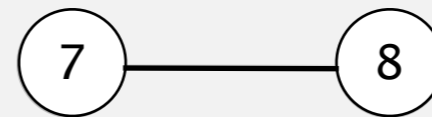| v	marked[]	edgeTo[]
0	T	–
1	F	–
2	F	–
3	F	–
4	F	–
5	F	–
6	F	–
7	F	–
8	F	–
9	F	–
10	F	–
11	F	–
12	F	–

visit 0

Depth-first search demo

To visit a vertex *v* :

- Mark vertex *v* as visited.
- Recursively visit all unmarked vertices adjacent to *v*.

v	marked[]	edgeTo[]
0	T	–
1	F	–
2	F	–
3	F	–
4	F	–
5	F	–
6	T	0
7	F	–
8	F	–
9	F	–
10	F	–
11	F	–
12	F	–

visit 6

Depth-first search demo

To visit a vertex *v* :

- Mark vertex *v* as visited.
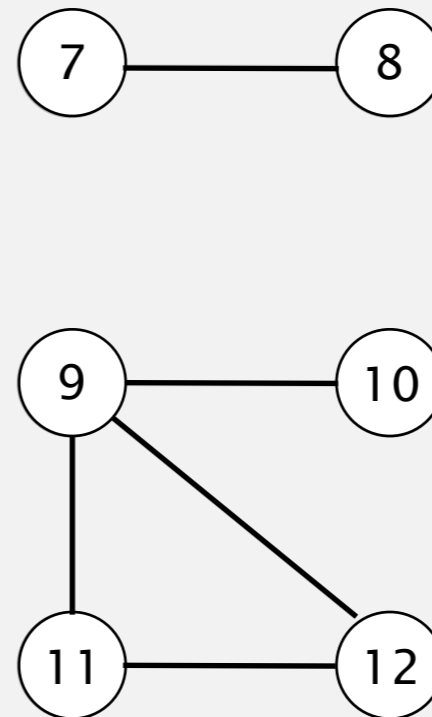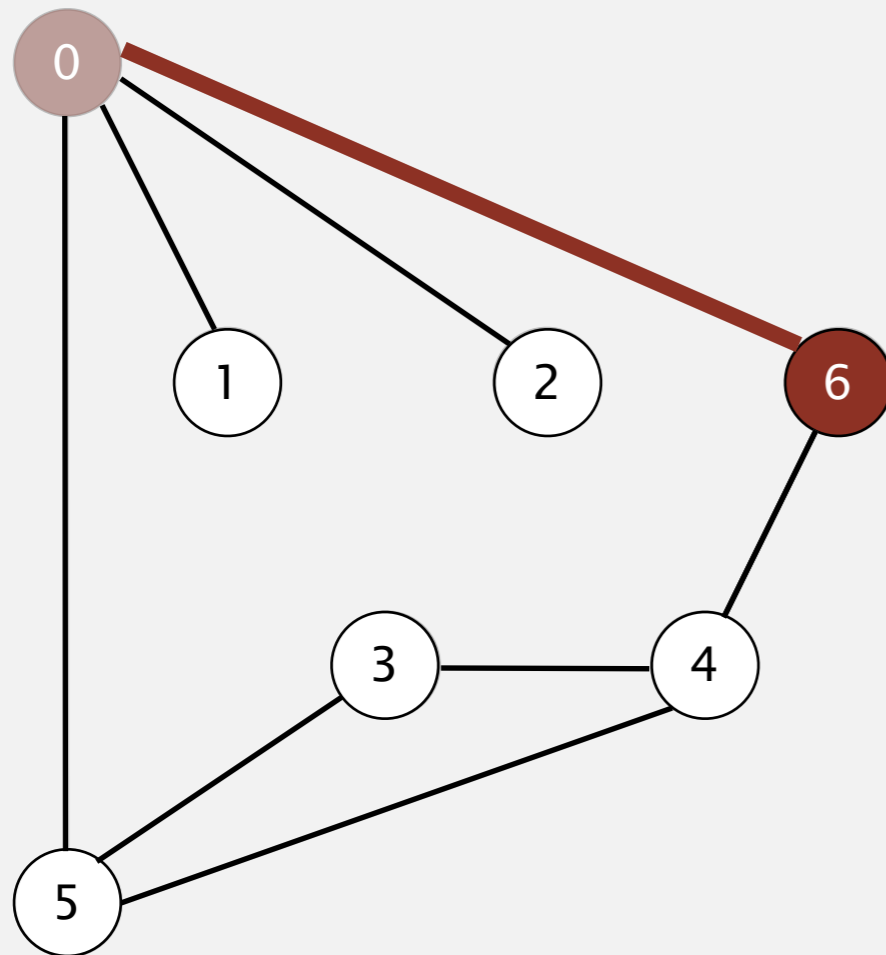- Recursively visit all unmarked vertices adjacent to *v*.

v	marked[]	edgeTo[]
0	T	–
1	F	–
2	F	–
3	F	–
4	F	–
5	F	–
6	T	0
7	F	–
8	F	–
9	F	–
10	F	–
11	F	–
12	F	–

visit 6

Depth-first search demo

To visit a vertex v :

- Mark vertex v as visited.
- Recursively visit all unmarked vertices adjacent to v.

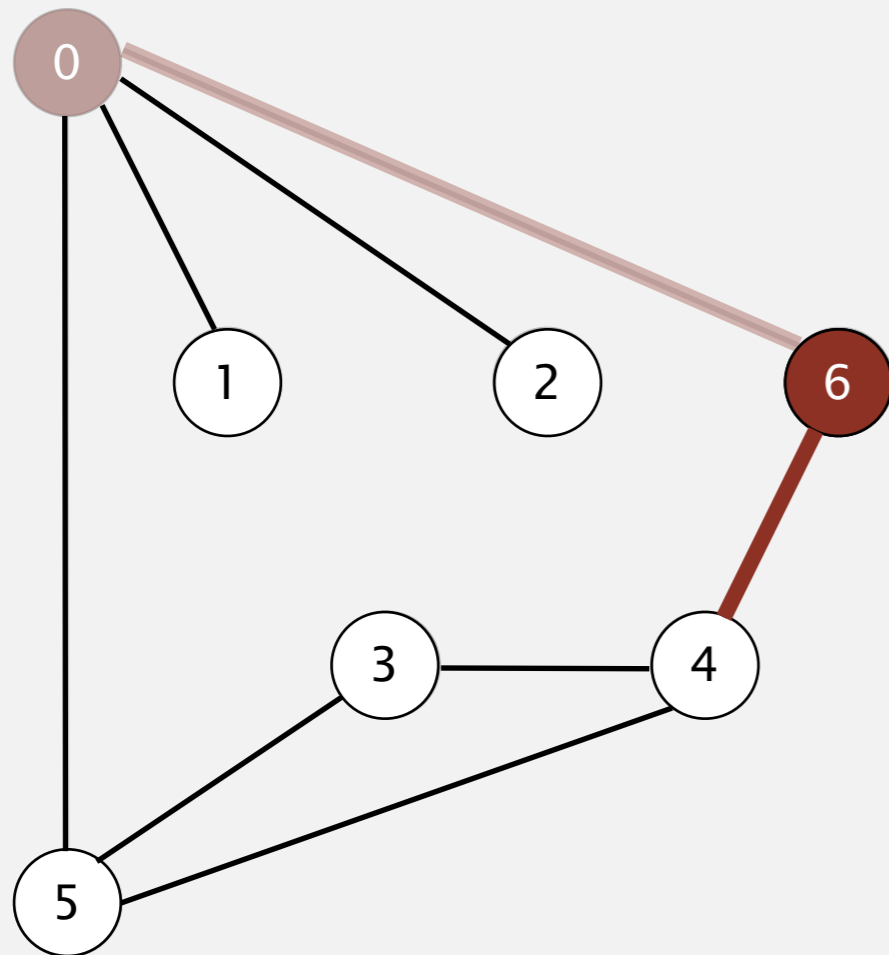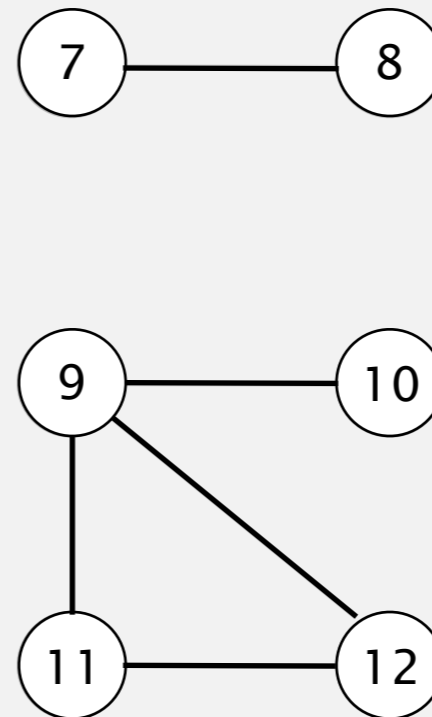| v	marked[]	edgeTo[]
0	T	–
1	F	–
2	F	–
3	F	–
4	T	6
5	F	–
6	T	0
7	F	–
8	F	–
9	F	–
10	F	–
11	F	–
12	F	–

visit 4

Depth-first search demo

To visit a vertex v :

- Mark vertex v as visited.

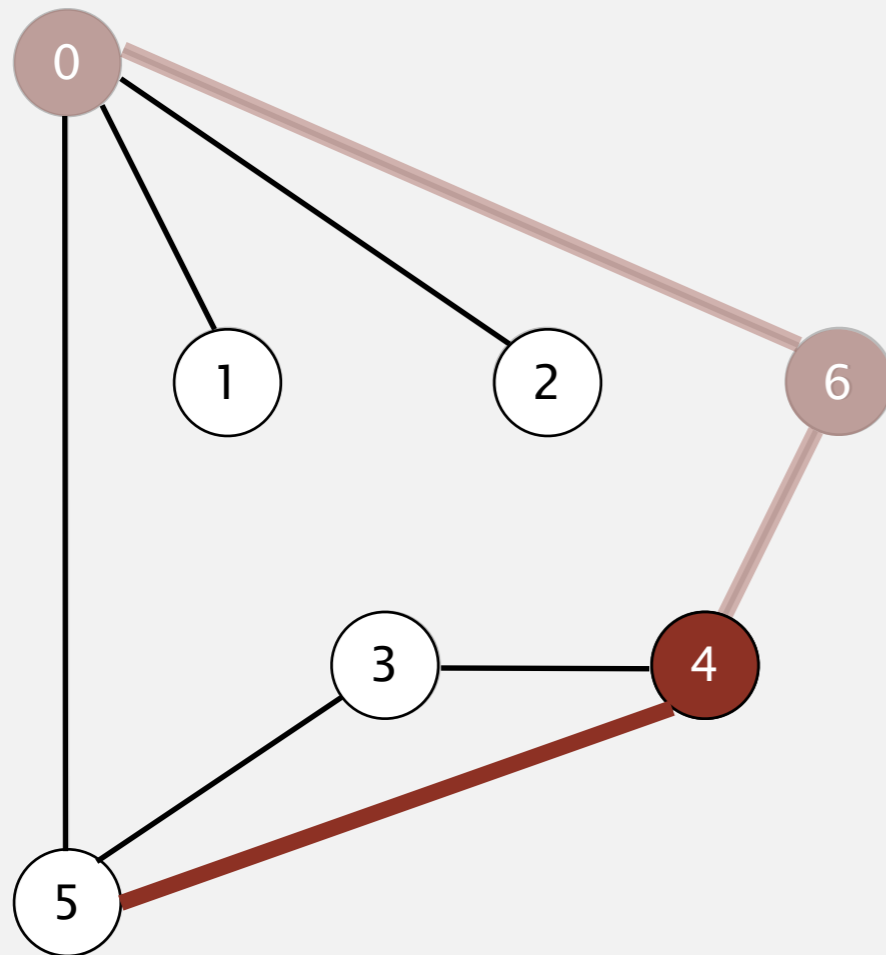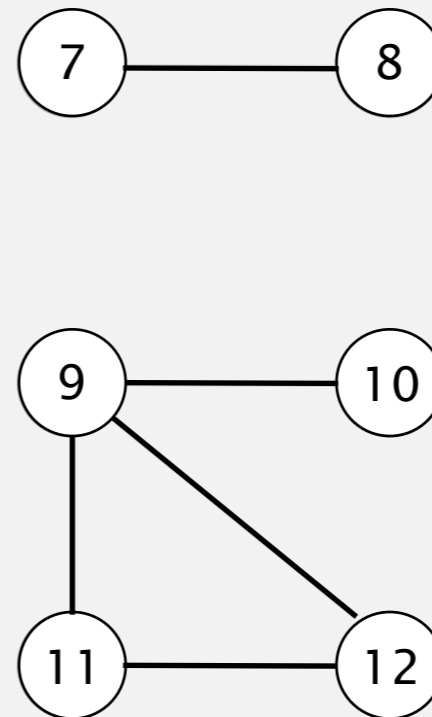- Recursively visit all unmarked vertices adjacent to v.

v	marked[]	edgeTo[]
0	T	–
1	F	–
2	F	–
3	F	–
4	T	6
5	T	4
6	T	0
7	F	–
8	F	–
9	F	–
10	F	–
11	F	–
12	F	–

visit 5

Depth-first search demo

To visit a vertex v :

- Mark vertex v as visited.

- Recursively visit all unmarked vertices adjacent to v.

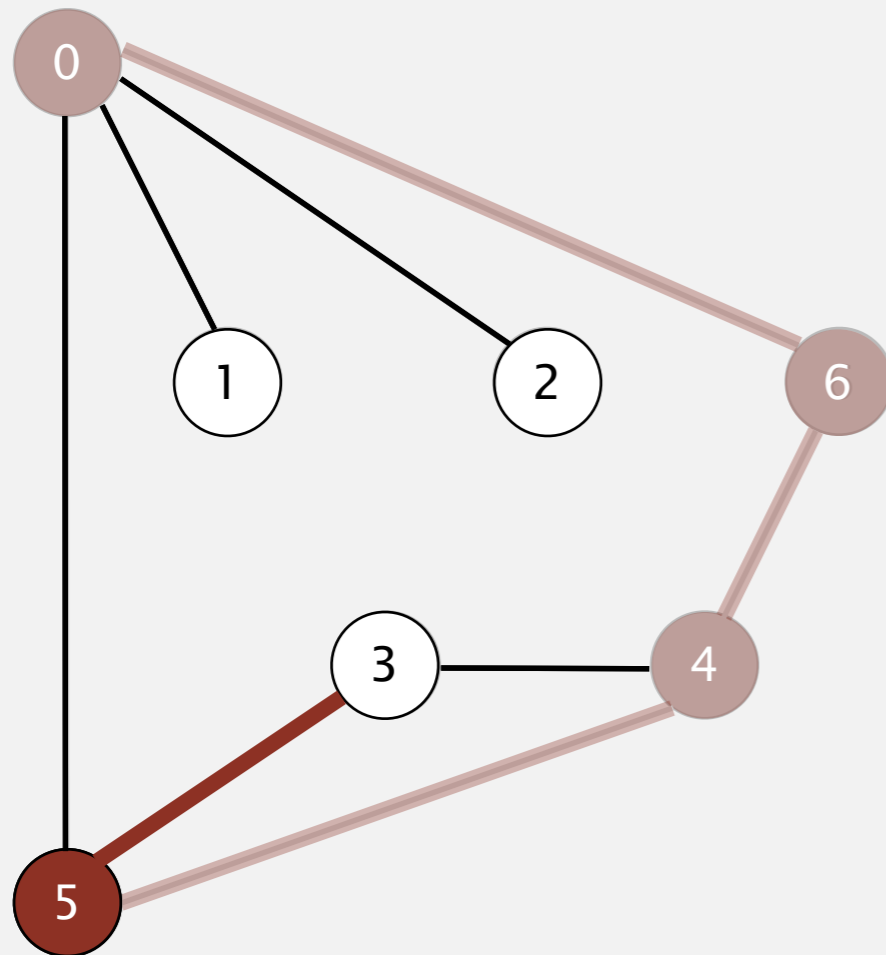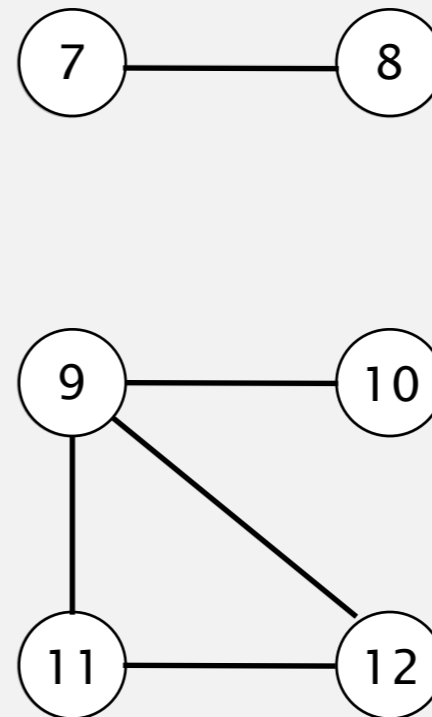visit 3

v	marked[]	edgeTo[]
0	T	–
1	F	–
2	F	–
3	T	5
4	T	6
5	T	4
6	T	0
7	F	–
8	F	–
9	F	–
10	F	–
11	F	–
12	F	–

Depth-first search demo

To visit a vertex v :
- Mark vertex v as visited.
- Recursively visit all unmarked vertices adjacent to v.

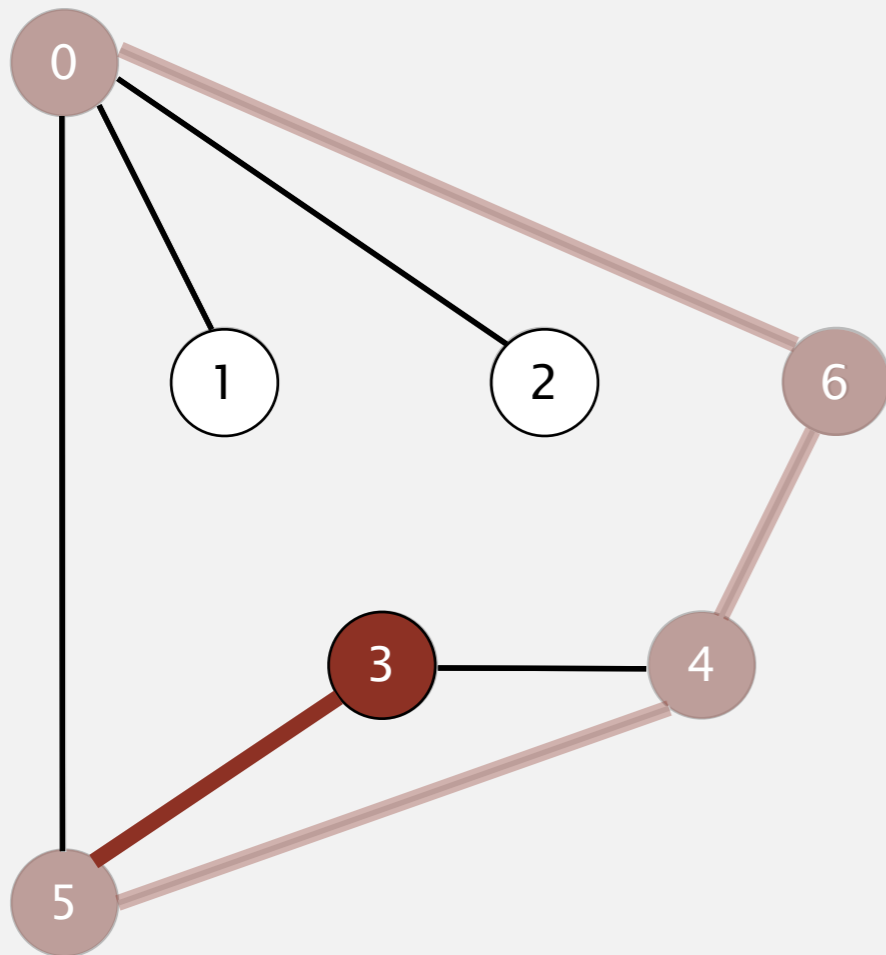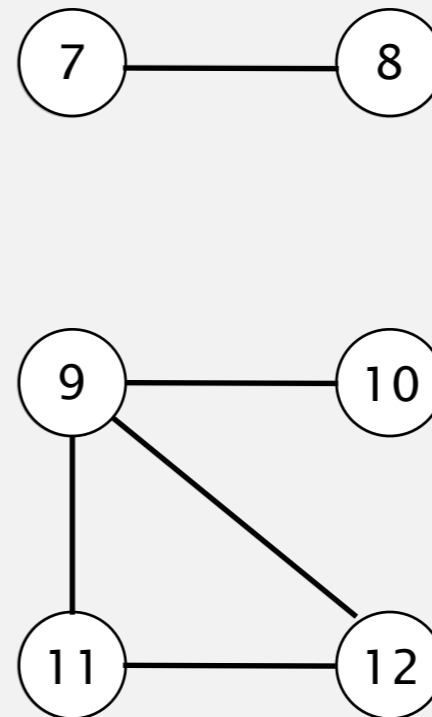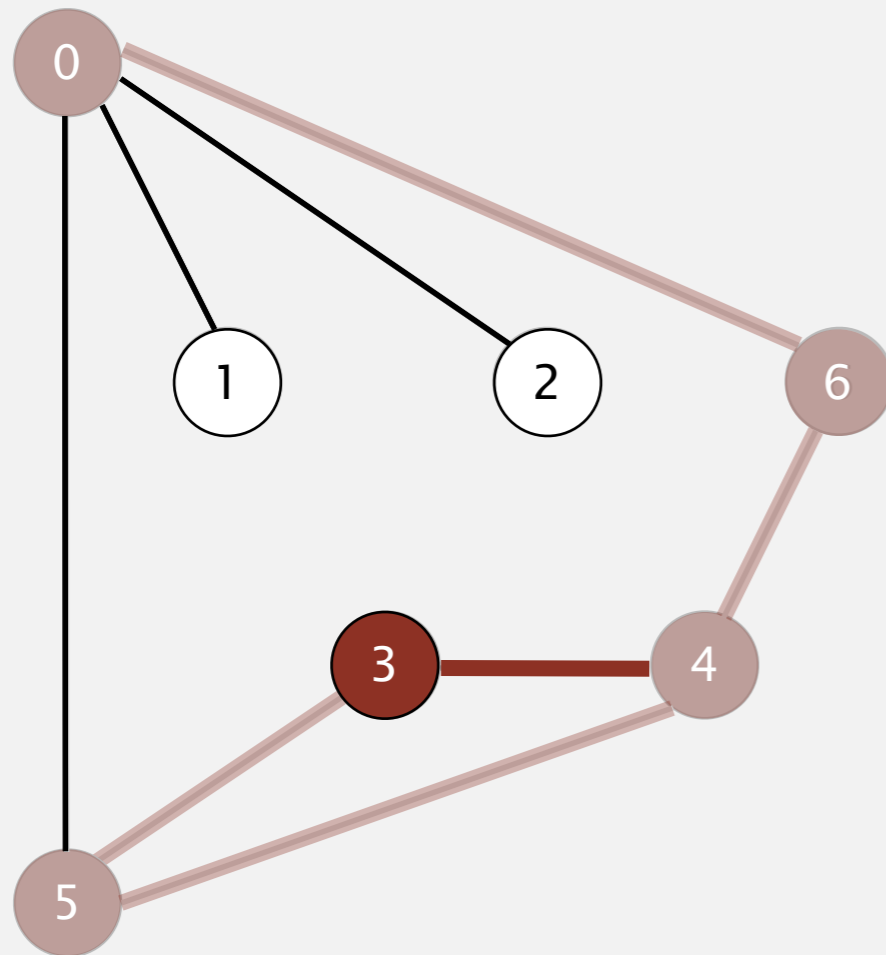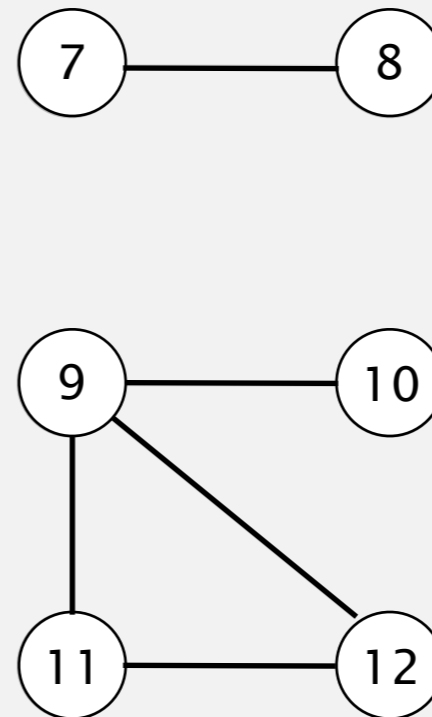| v	marked[]	edgeTo[]
0	T	–
1	F	–
2	F	–
3	T	5
4	T	6
5	T	4
6	T	0
7	F	–
8	F	–
9	F	–
10	F	–
11	F	–
12	F	–

visit 3

Depth-first search demo

To visit a vertex *v* :

- Mark vertex *v* as visited.

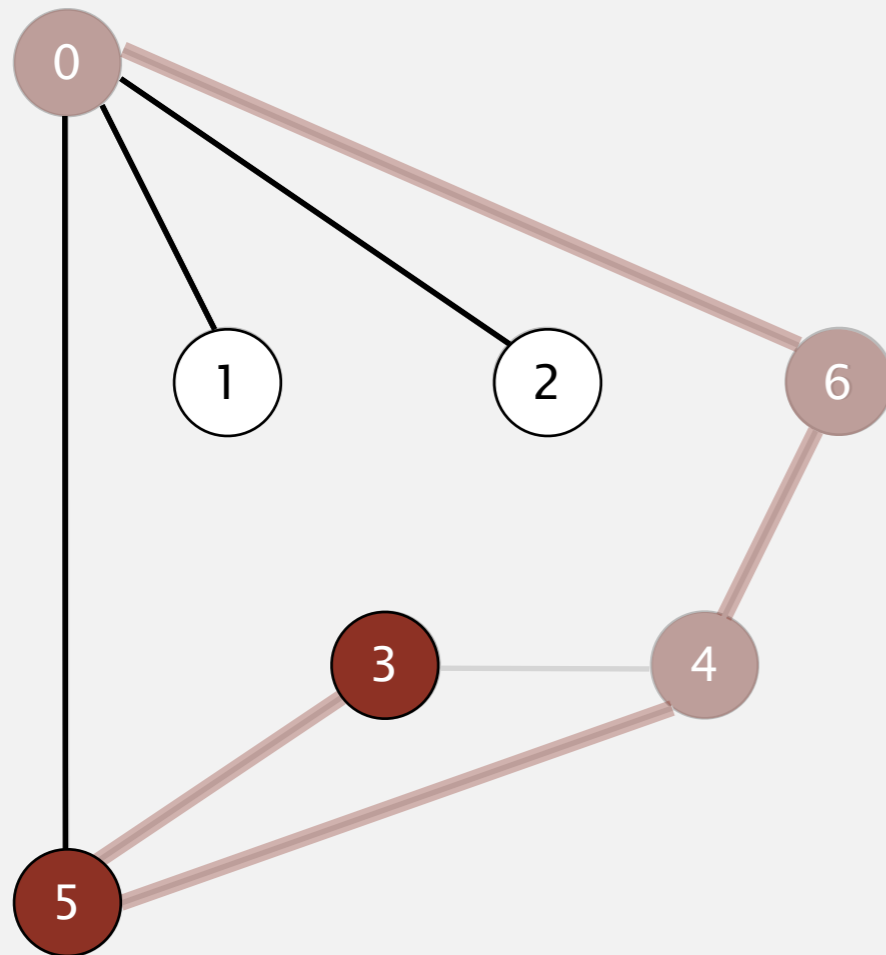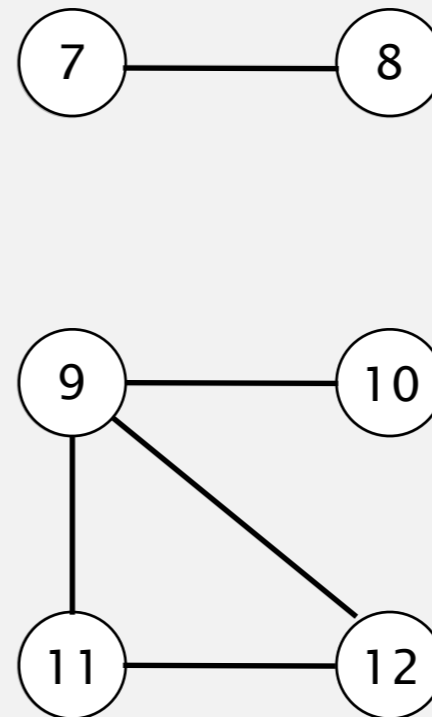- Recursively visit all unmarked vertices adjacent to *v*.

3 done

v	marked[]	edgeTo[]
0	T	–
1	F	–
2	F	–
3	T	5
4	T	6
5	T	4
6	T	0
7	F	–
8	F	–
9	F	–
10	F	–
11	F	–
12	F	–

Depth-first search demo

To visit a vertex *v* :

- Mark vertex *v* as visited.
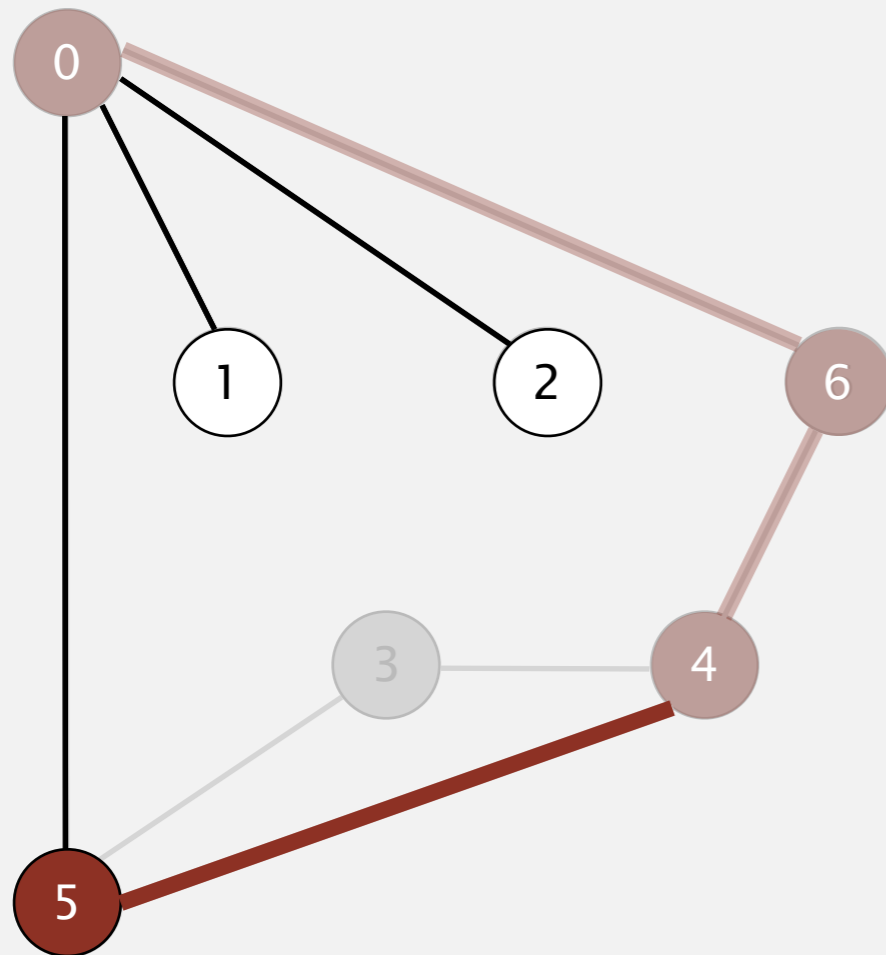
- Recursively visit all unmarked vertices adjacent to *v*.

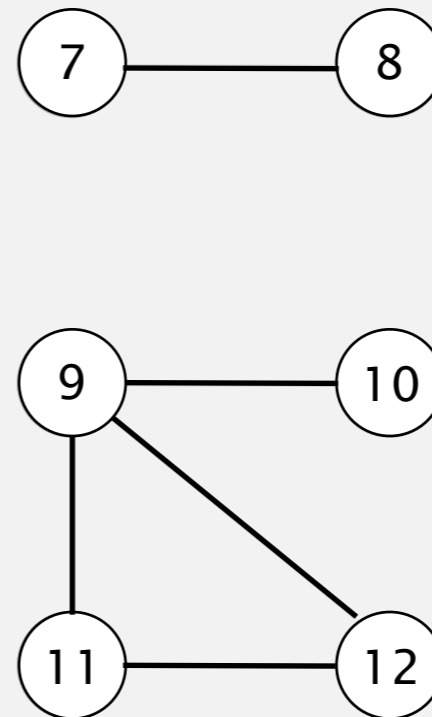| v	marked[]	edgeTo[]
0	T	–
1	F	–
2	F	–
3	T	5
4	T	6
5	T	4
6	T	0
7	F	–
8	F	–
9	F	–
10	F	–
11	F	–
12	F	–

visit 5

Depth-first search demo

To visit a vertex *v* :

- Mark vertex *v* as visited.
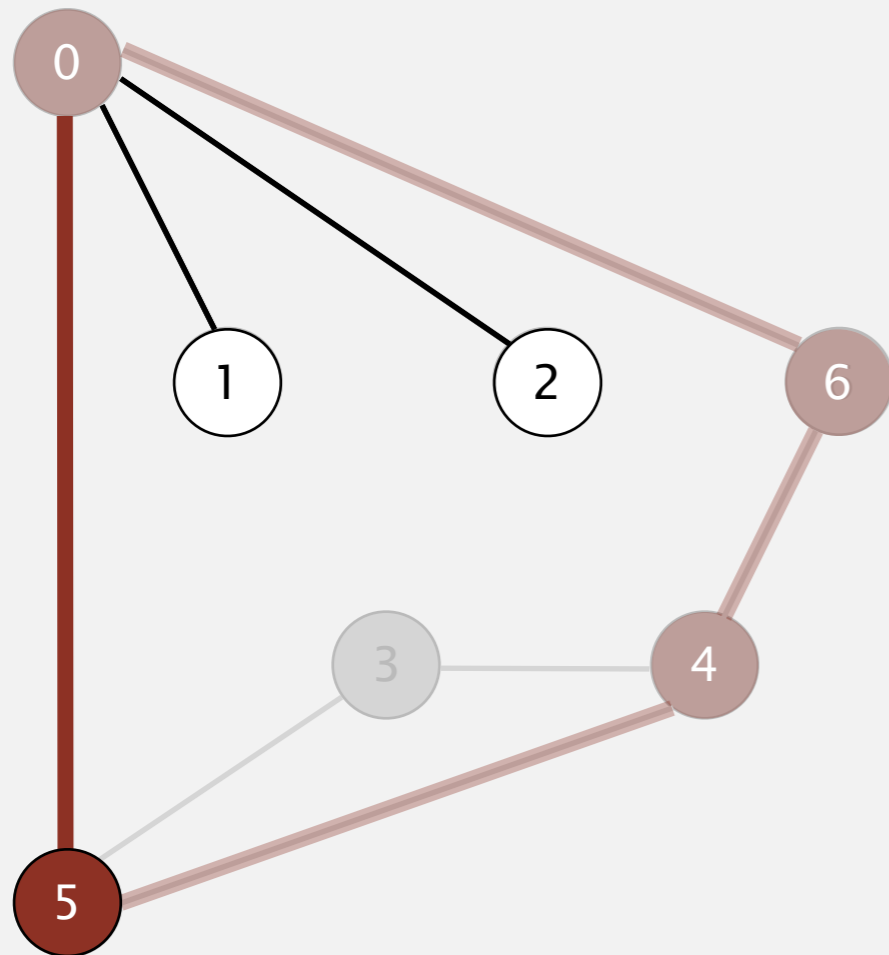- Recursively visit all unmarked vertices adjacent to *v*.

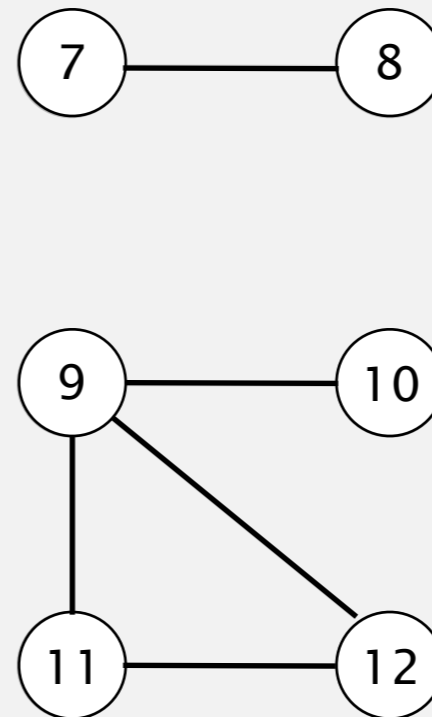| v	marked[]	edgeTo[]
0	T	–
1	F	–
2	F	–
3	T	5
4	T	6
5	T	4
6	T	0
7	F	–
8	F	–
9	F	–
10	F	–
11	F	–
12	F	–

visit 5

Depth-first search demo

To visit a vertex *v* :

- Mark vertex *v* as visited.

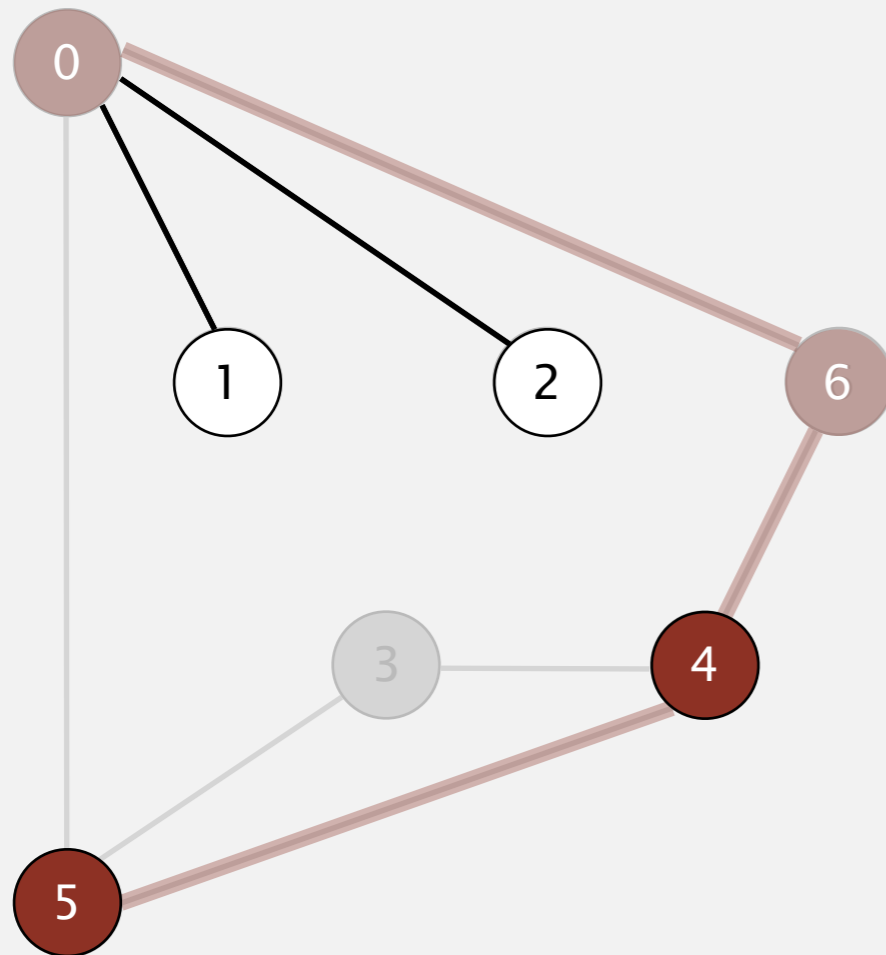- Recursively visit all unmarked vertices adjacent to *v*.

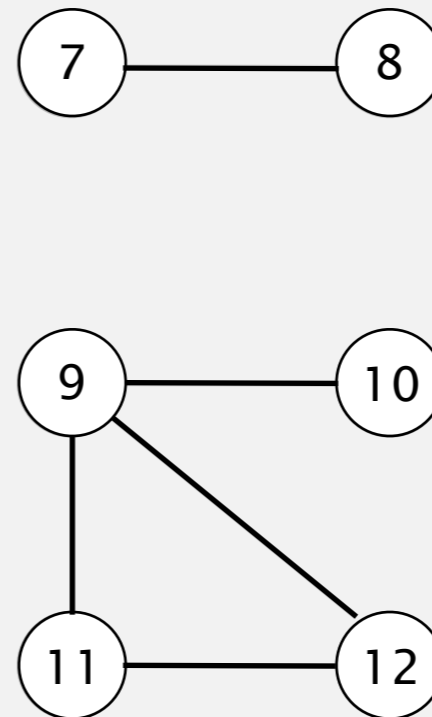| v	marked[]	edgeTo[]
0	T	–
1	F	–
2	F	–
3	T	5
4	T	6
5	T	4
6	T	0
7	F	–
8	F	–
9	F	–
10	F	–
11	F	–
12	F	–

5 done

Depth-first search demo

To visit a vertex *v* :

- Mark vertex *v* as visited.
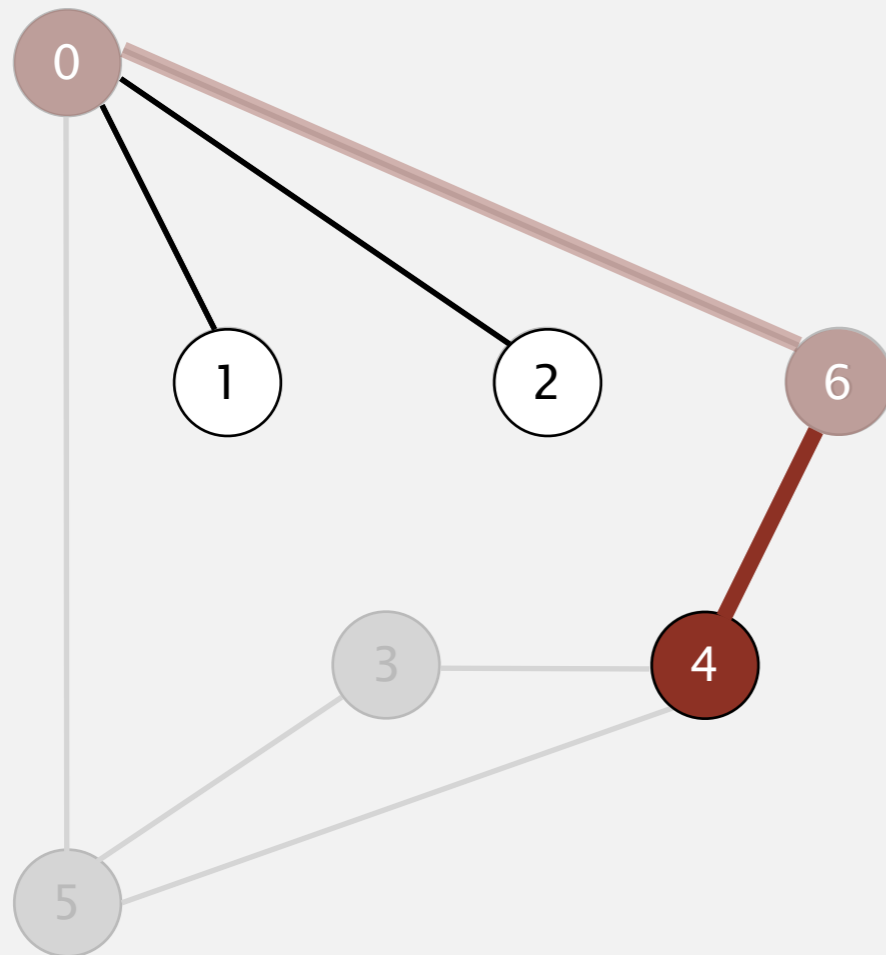- Recursively visit all unmarked vertices adjacent to *v*.

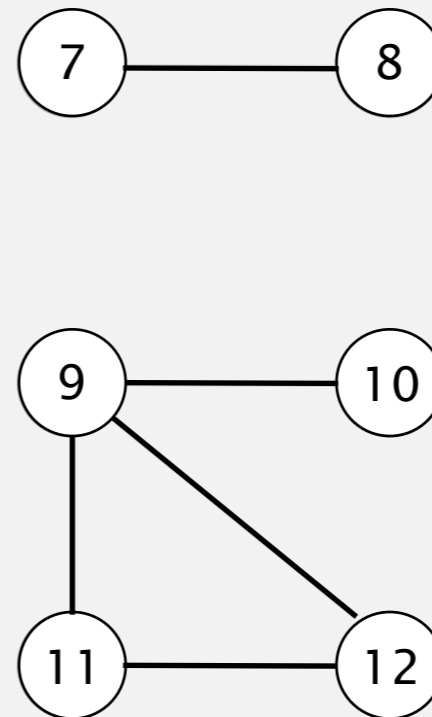| v	marked[]	edgeTo[]
0	T	–
1	F	–
2	F	–
3	T	5
4	T	6
5	T	4
6	T	0
7	F	–
8	F	–
9	F	–
10	F	–
11	F	–
12	F	–

visit 4

Depth-first search demo

To visit a vertex *v* :

- Mark vertex *v* as visited.
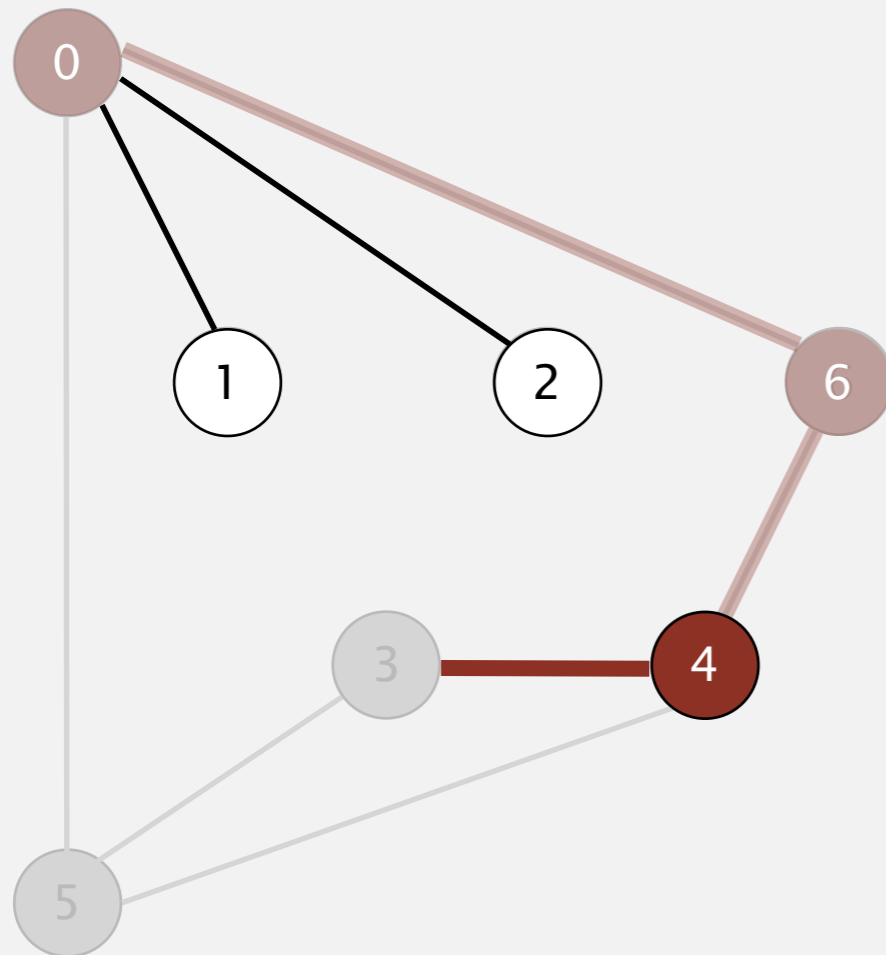- Recursively visit all unmarked vertices adjacent to *v*.

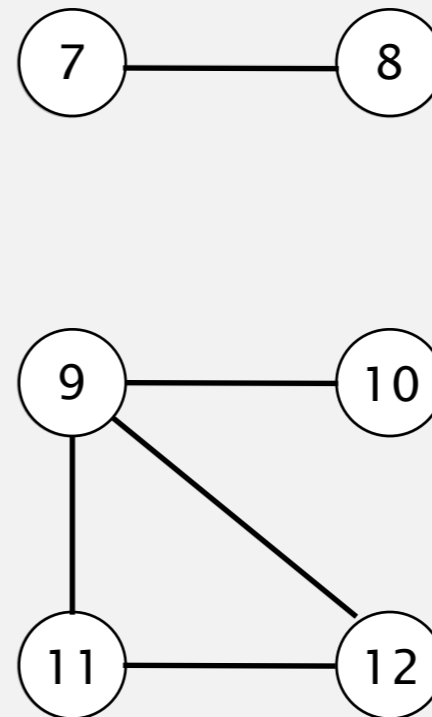| v	marked[]	edgeTo[]
0	T	–
1	F	–
2	F	–
3	T	5
4	T	6
5	T	4
6	T	0
7	F	–
8	F	–
9	F	–
10	F	–
11	F	–
12	F	–

visit 4

Depth-first search demo

To visit a vertex v :

- Mark vertex v as visited.
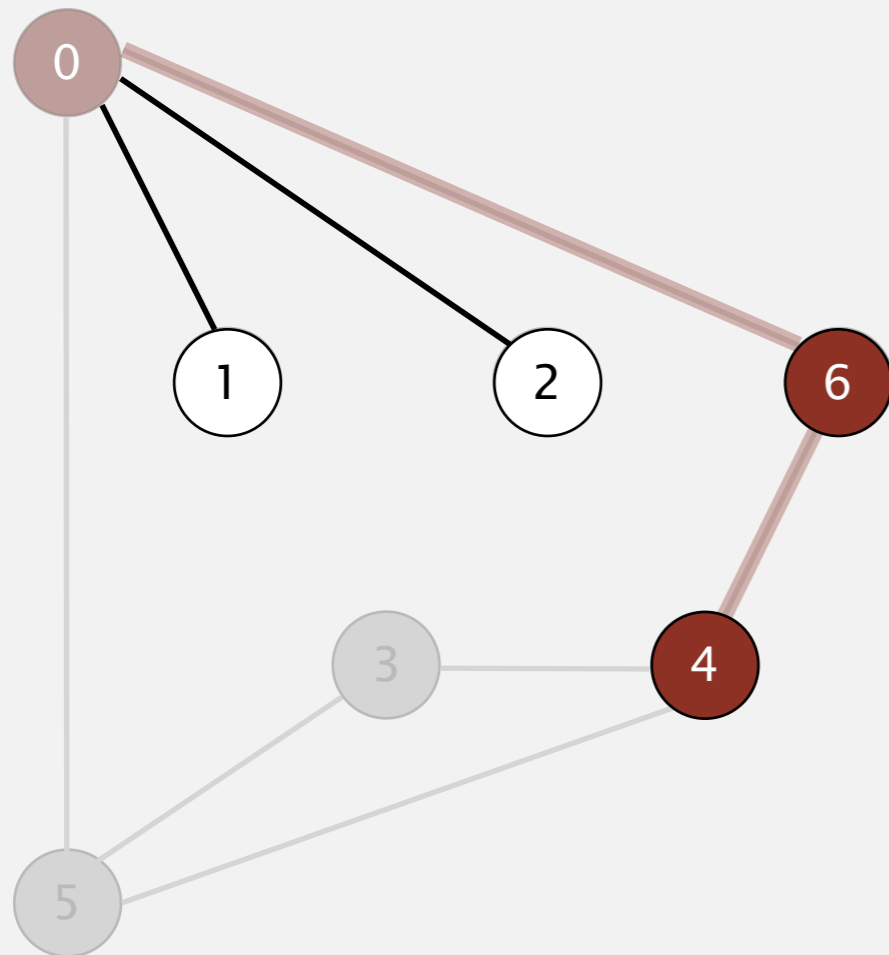- Recursively visit all unmarked vertices adjacent to v.

4 done

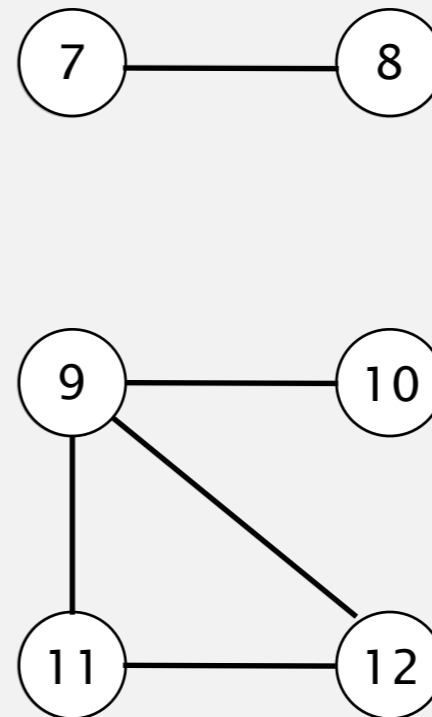| v	marked[]	edgeTo[]
0	T	–
1	F	–
2	F	–
3	T	5
4	T	6
5	T	4
6	T	0
7	F	–
8	F	–
9	F	–
10	F	–
11	F	–
12	F	–

Depth-first search demo

To visit a vertex v :

- Mark vertex v as visited.

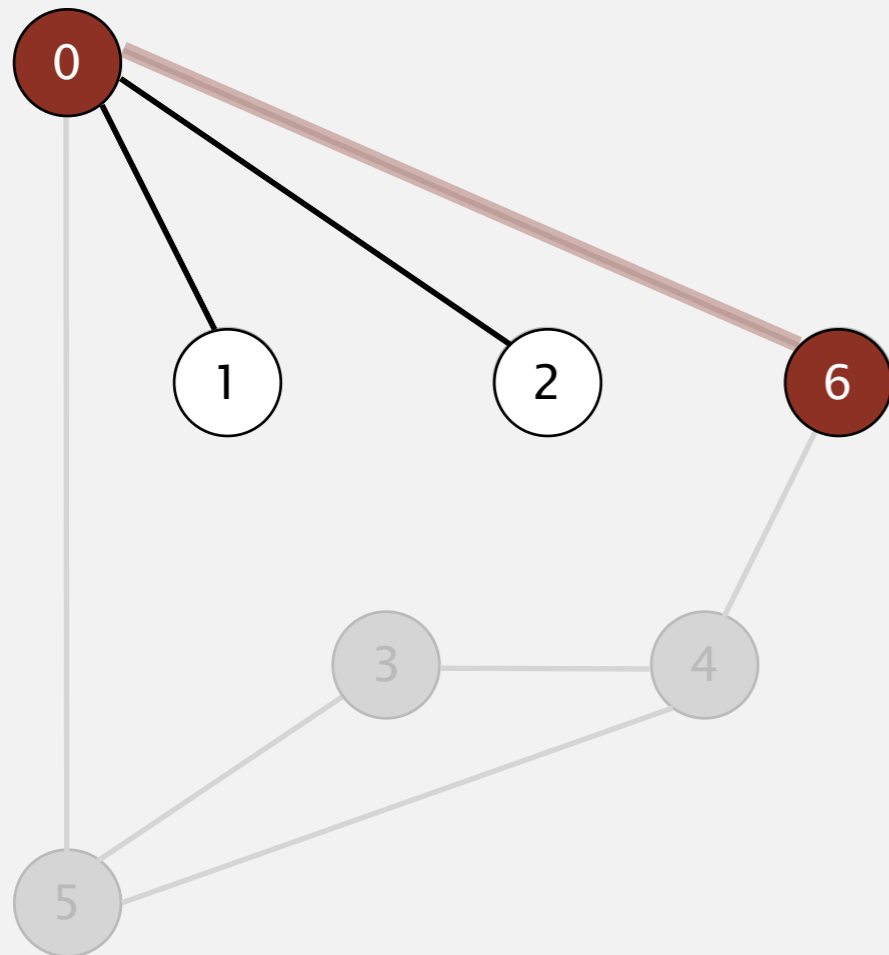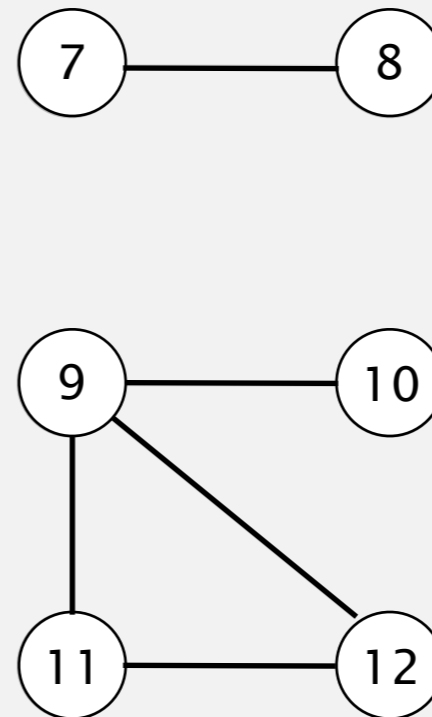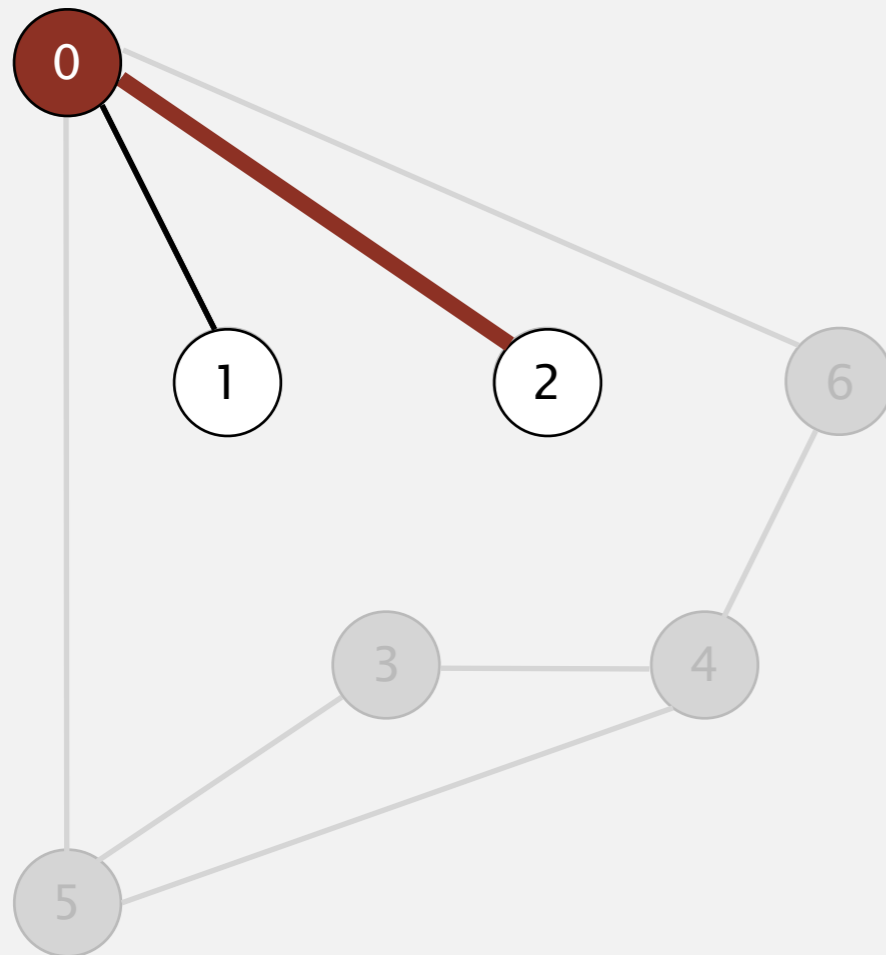- Recursively visit all unmarked vertices adjacent to v.

6 done

v	marked[]	edgeTo[]
0	T	–
1	F	–
2	F	–
3	T	5
4	T	6
5	T	4
6	T	0
7	F	–
8	F	–
9	F	–
10	F	–
11	F	–
12	F	–

Depth-first search demo

To visit a vertex *v* :

- Mark vertex *v* as visited.

- Recursively visit all unmarked vertices adjacent to *v*.

v	marked[]	edgeTo[]
0	T	–
1	F	–
2	F	–
3	T	5
4	T	6
5	T	4
6	T	0
7	F	–
8	F	–
9	F	–
10	F	–
11	F	–
12	F	–

visit 0
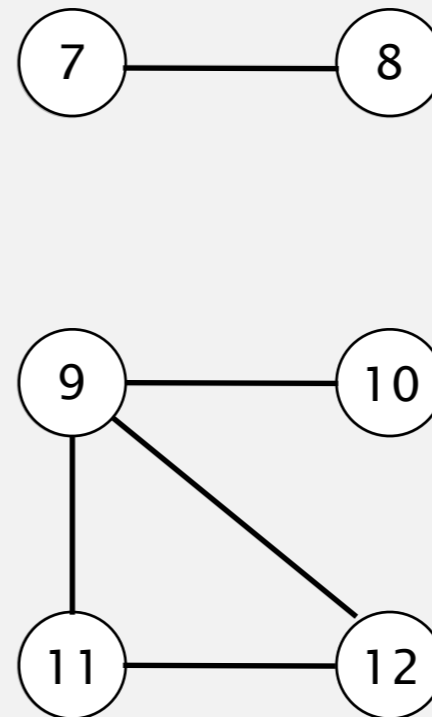
Depth-first search demo

To visit a vertex *v* :

- Mark vertex *v* as visited.
- Recursively visit all unmarked vertices adjacent to *v*.

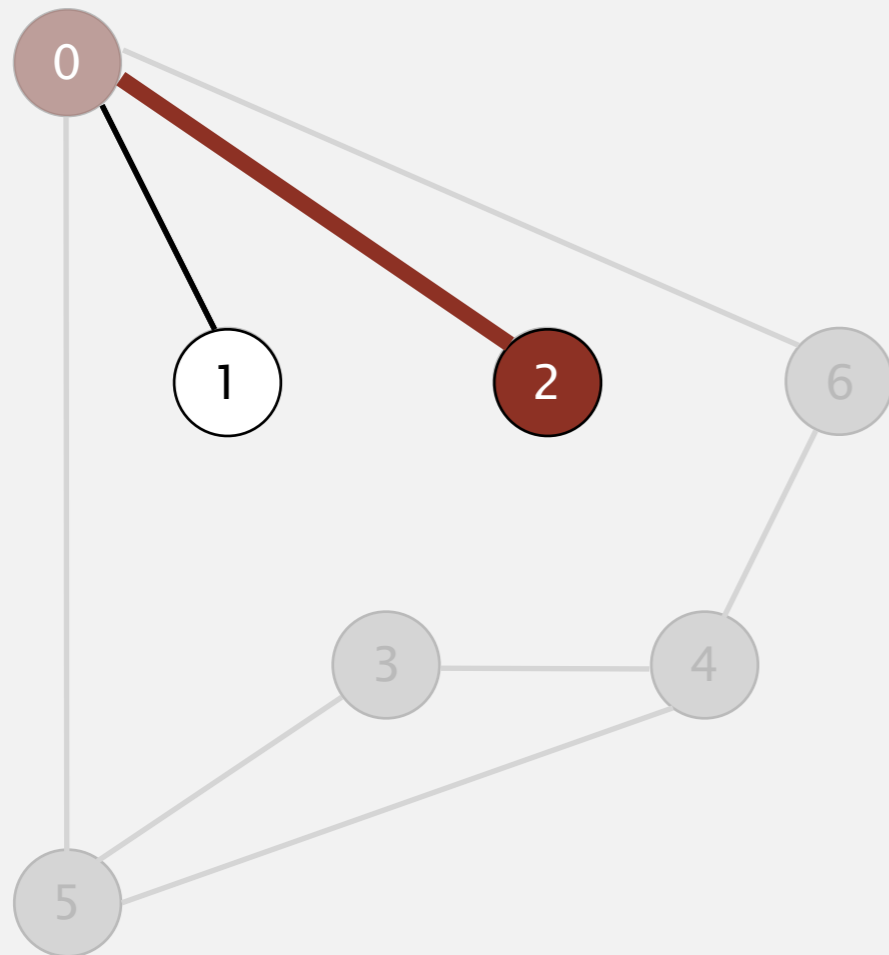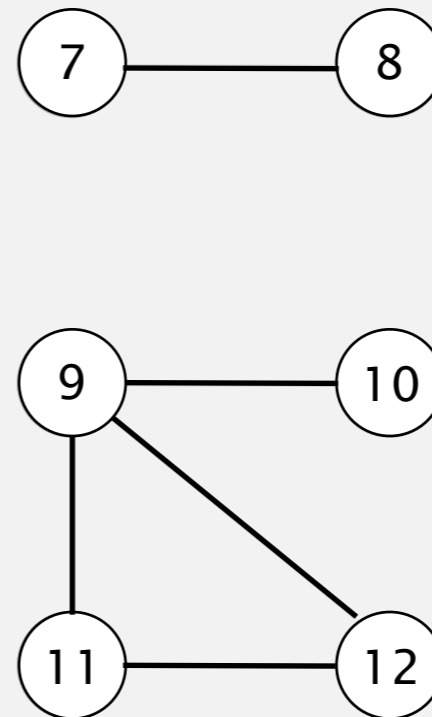visit 2

v	marked[]	edgeTo[]
0	T	–
1	F	–
2	T	0
3	T	5
4	T	6
5	T	4
6	T	0
7	F	–
8	F	–
9	F	–
10	F	–
11	F	–
12	F	–

Depth-first search demo

To visit a vertex v :

- Mark vertex v as visited.
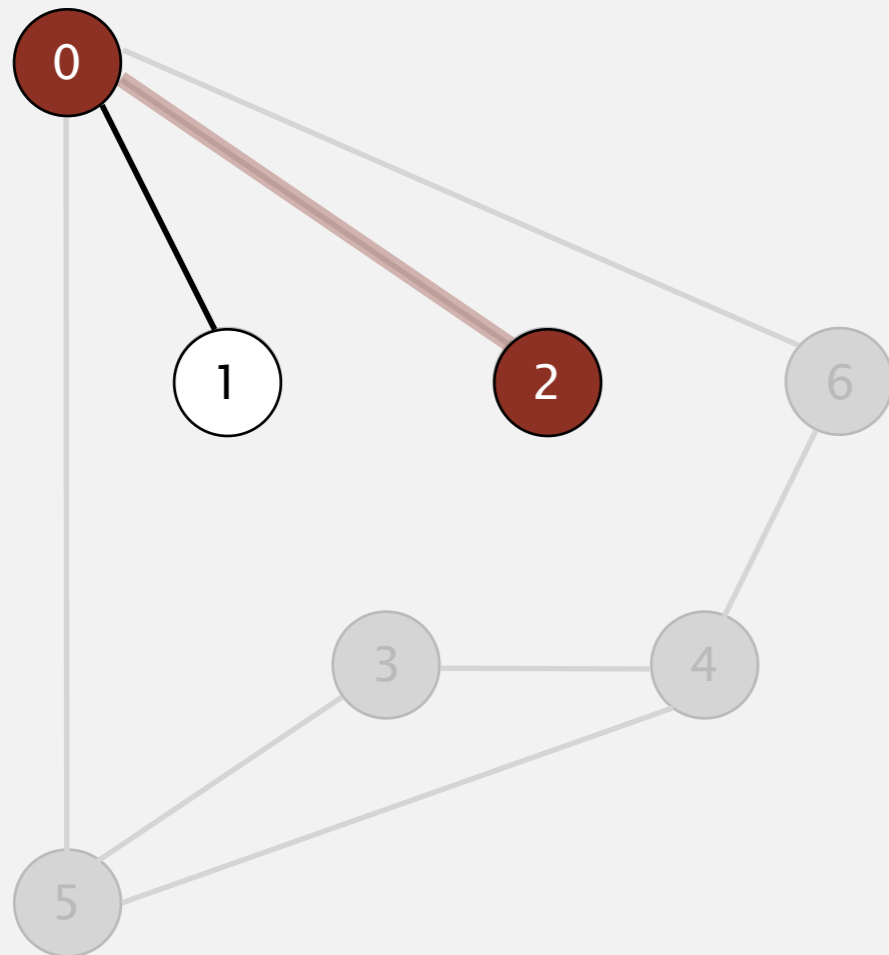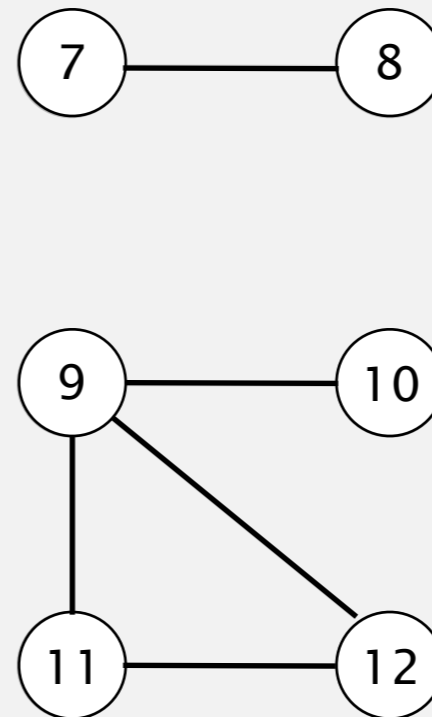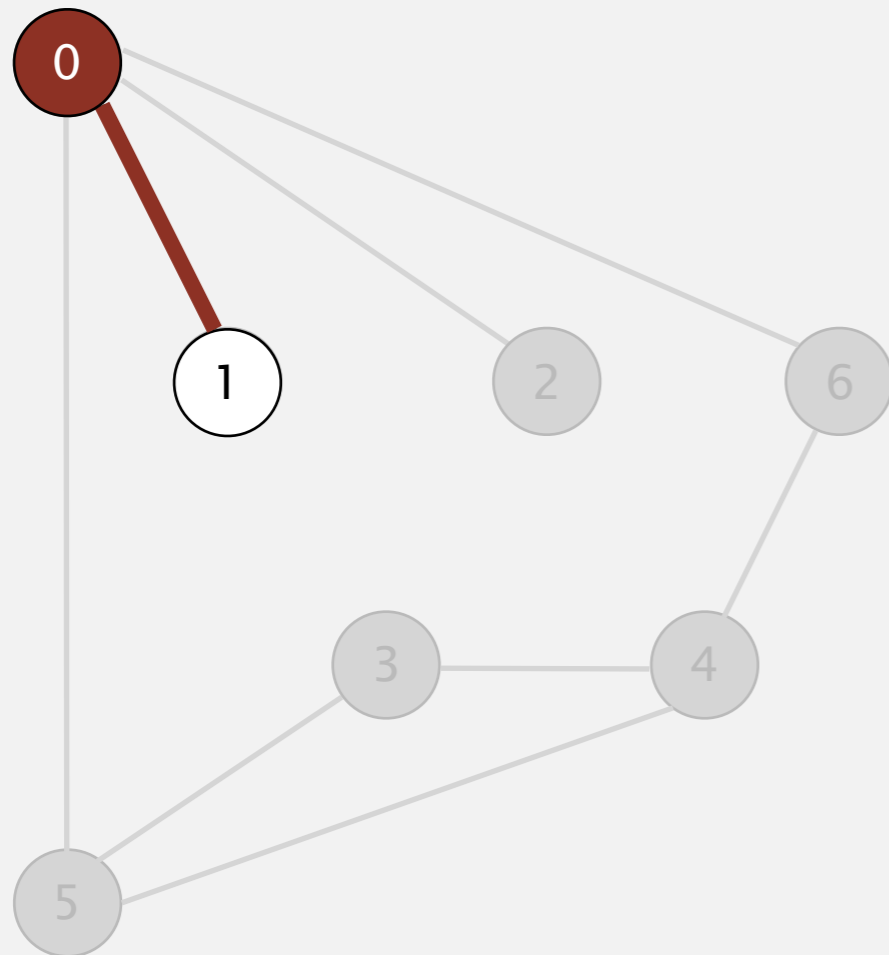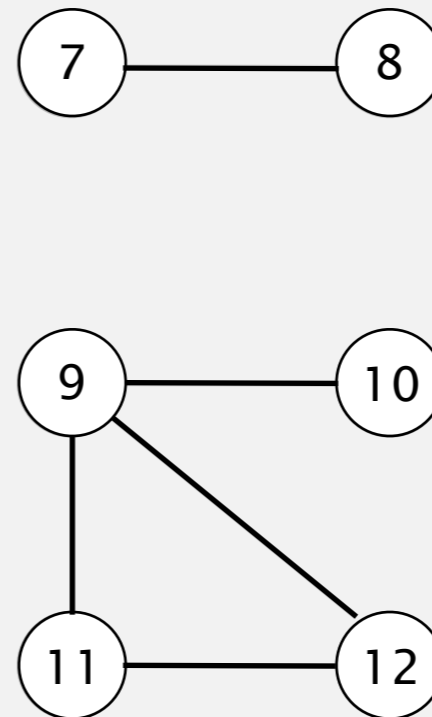- Recursively visit all unmarked vertices adjacent to v.

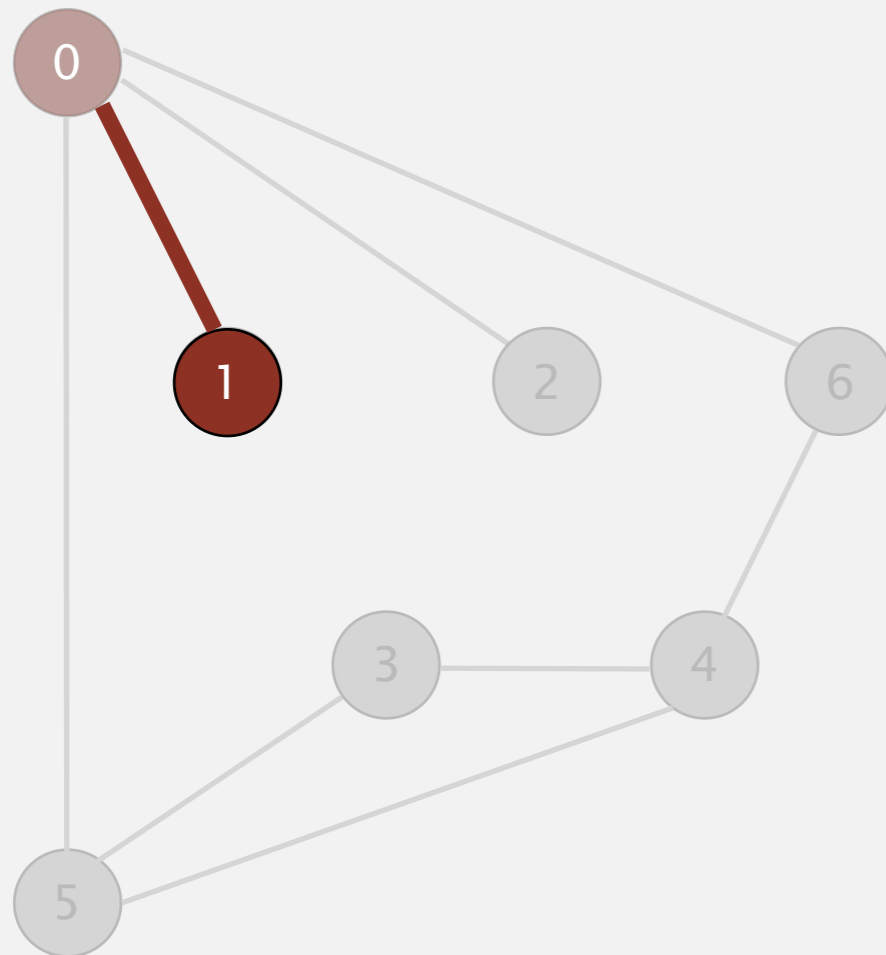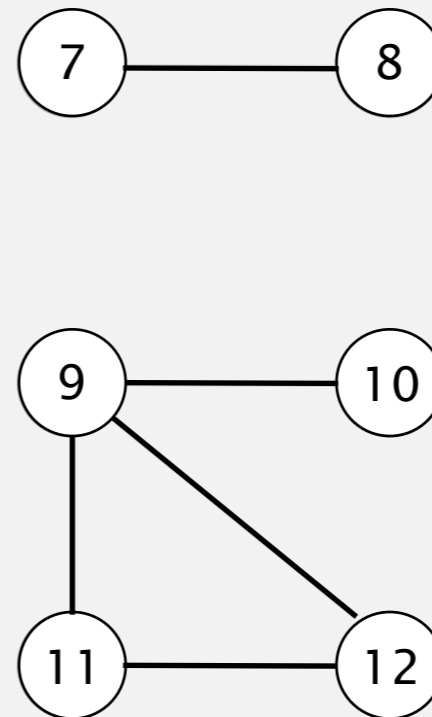| v	marked[]	edgeTo[]
0	T	–
1	F	–
2	T	0
3	T	5
4	T	6
5	T	4
6	T	0
7	F	–
8	F	–
9	F	–
10	F	–
11	F	–
12	F	–

2 done

Depth-first search demo

To visit a vertex *v* :

- Mark vertex *v* as visited.
- Recursively visit all unmarked vertices adjacent to *v*.

v	marked[]	edgeTo[]
0	T	–
1	F	–
2	T	0
3	T	5
4	T	6
5	T	4
6	T	0
7	F	–
8	F	–
9	F	–
10	F	–
11	F	–
12	F	–

visit 0

Depth-first search demo

To visit a vertex *v* :

- Mark vertex *v* as visited.
- Recursively visit all unmarked vertices adjacent to *v*.

v	marked[]	edgeTo[]
0	T	–
1	T	0
2	T	0
3	T	5
4	T	6
5	T	4
6	T	0
7	F	–
8	F	–
9	F	–
10	F	–
11	F	–
12	F	–

visit 1

Depth-first search demo

To visit a vertex *v* :

- Mark vertex *v* as visited.
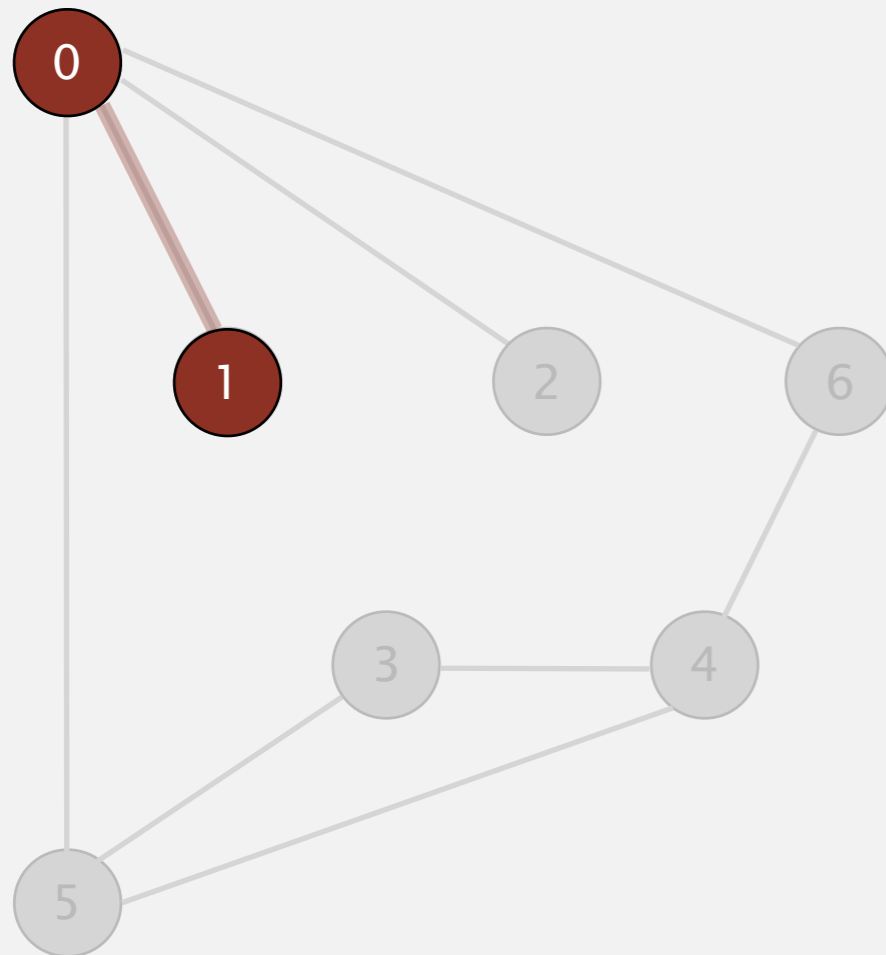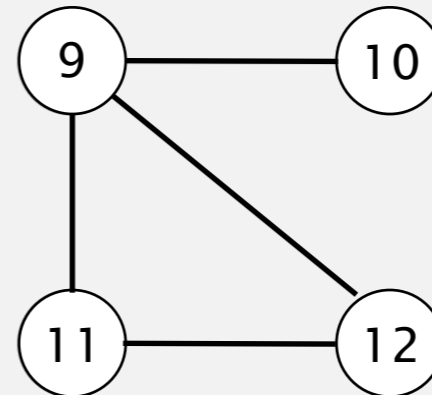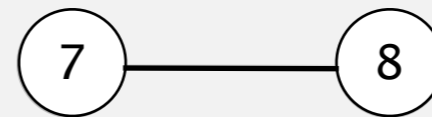- Recursively visit all unmarked vertices adjacent to *v*.

1 done

v	marked[]	edgeTo[]
0	T	–
1	T	0
2	T	0
3	T	5
4	T	6
5	T	4
6	T	0
7	F	–
8	F	–
9	F	–
10	F	–
11	F	–
12	F	–

Depth-first search demo

To visit a vertex *v* :

- Mark vertex *v* as visited.
- Recursively visit all unmarked vertices adjacent to *v*.

0 done
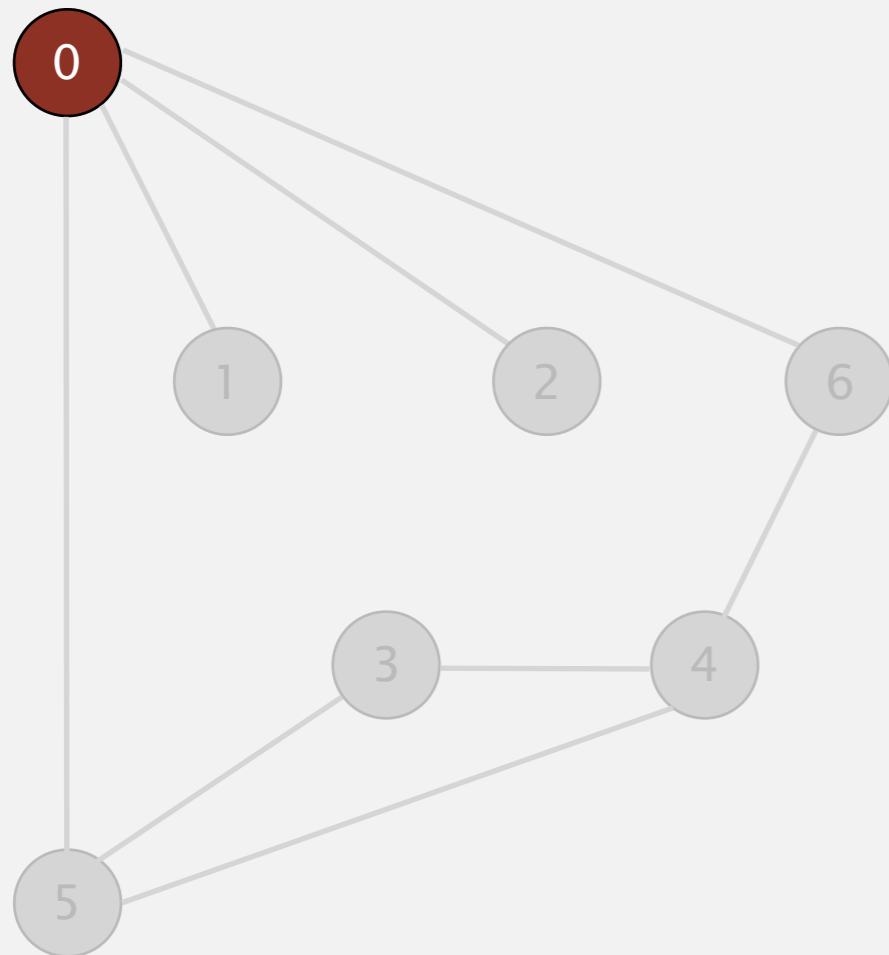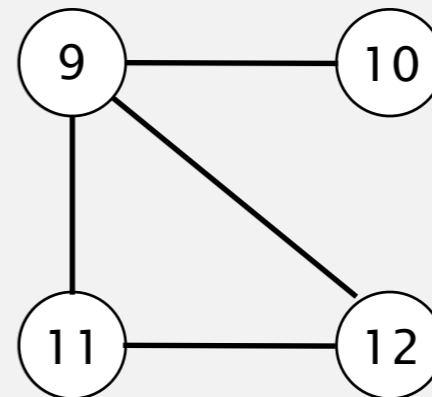
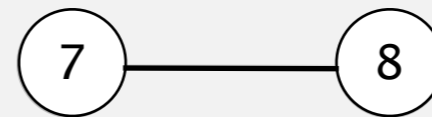| v	marked[]	edgeTo[]
0	T	–
1	T	0
2	T	0
3	T	5
4	T	6
5	T	4
6	T	0
7	F	–
8	F	–
9	F	–
10	F	–
11	F	–
12	F	–

Depth-first search demo

To visit a vertex v :

- Mark vertex v as visited.

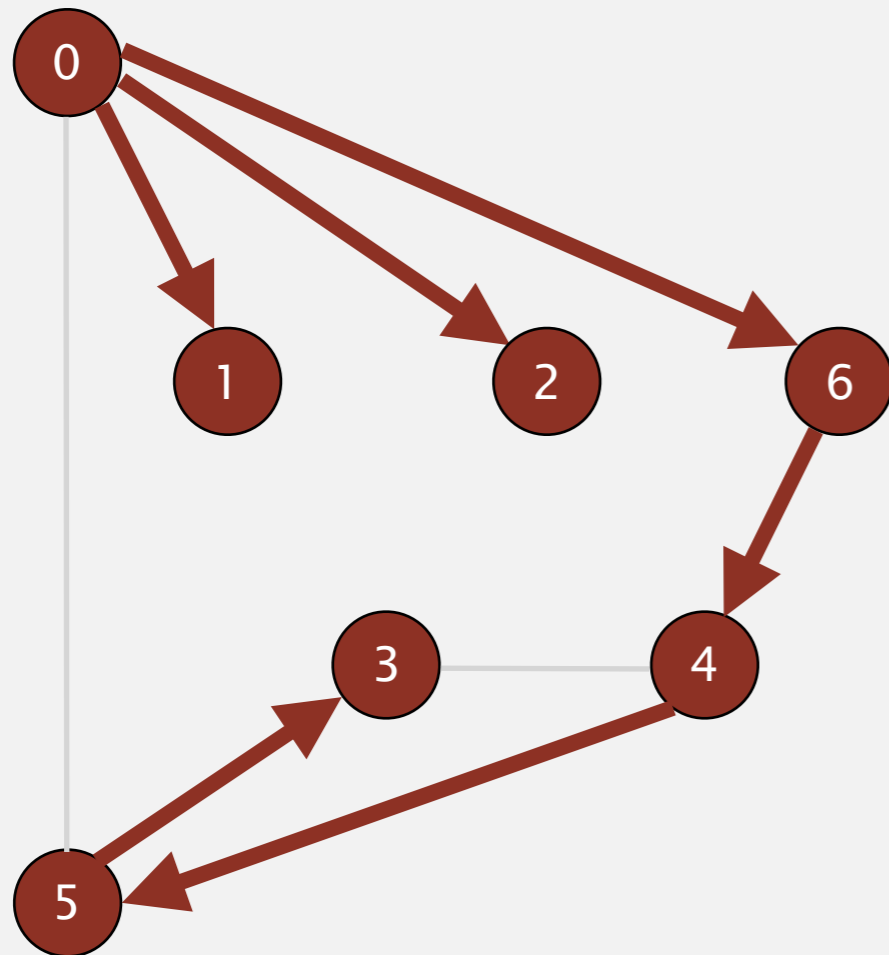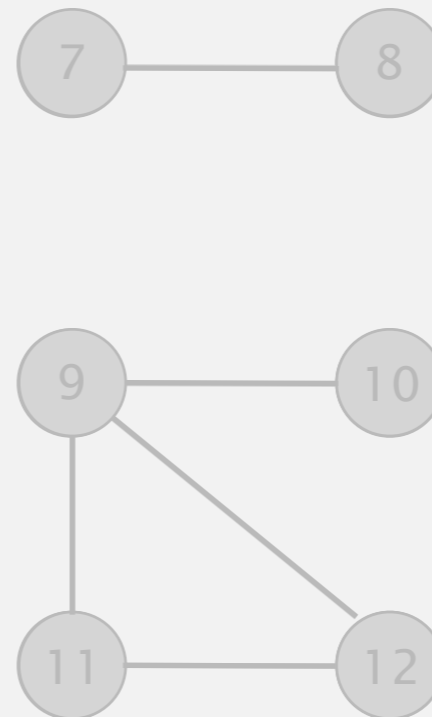- Recursively visit all unmarked vertices adjacent to v.

vertices reachable from 0

v	marked[]	edgeTo[]
0	T	–
1	T	0
2	T	0
3	T	5
4	T	6
5	T	4
6	T	0
7	F	–
8	F	–
9	F	–
10	F	–
11	F	–
12	F	–