

Depth-First Search

- *Depth-first search* is another strategy for exploring a graph
 - Explore “deeper” in the graph whenever possible
 - Edges are explored out of the most recently discovered vertex v that still has unexplored edges
 - When all of v 's edges have been explored, backtrack to the vertex from which v was discovered

Depth-First Search

- Vertices initially colored white
- Then colored gray when discovered
- Then black when finished

Depth-First Search: The Code

```
DFS(G) {
    for each vertex u in V
        color[u] = WHITE;
    time = 0; // global variable
    for each vertex u in V

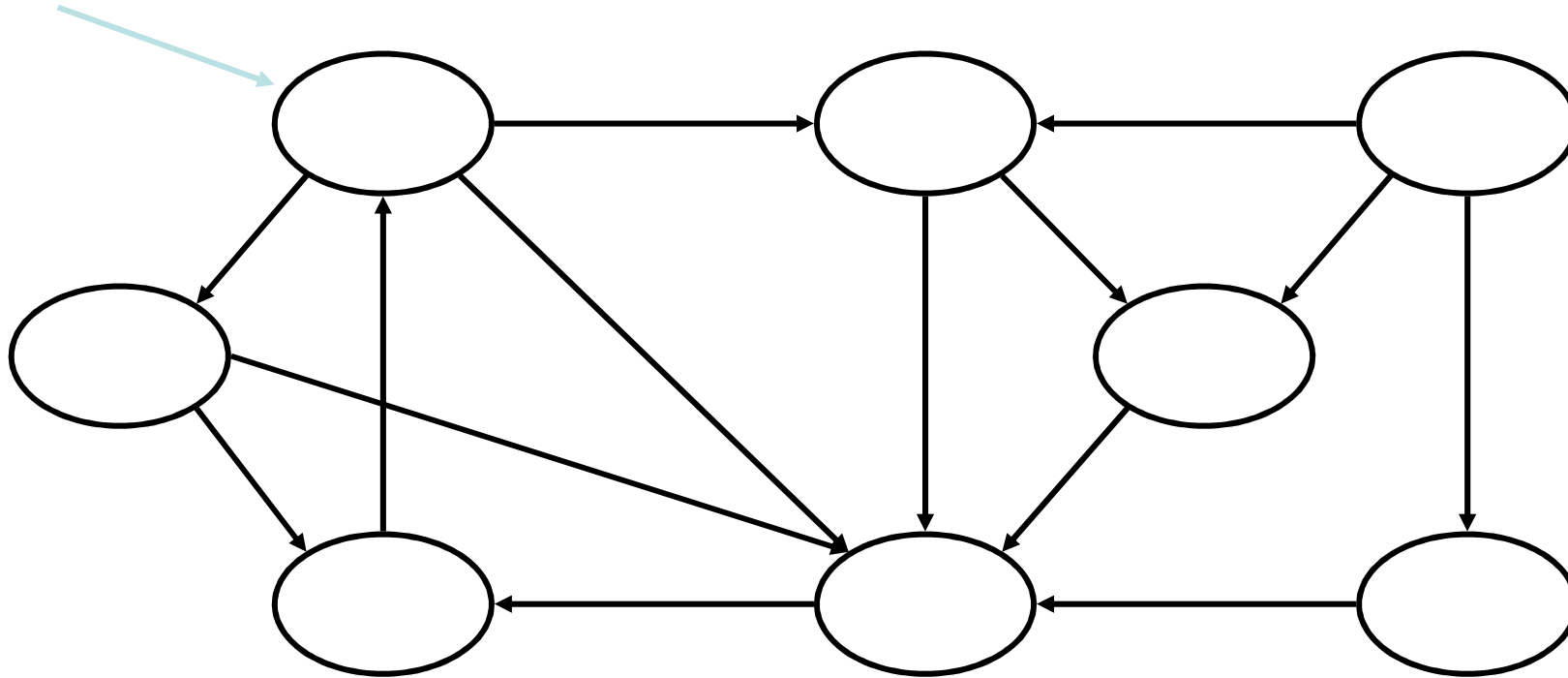
        if (color [u] == WHITE)
            DFS_Visit(u);
}

DFS_Visit(u) {
    color[u] = GRAY;
    time = time + 1; // global variable
    d[u] = time; // compute discovery time d[]
    for each v adjacent to u
        if (color[v] == WHITE) {
            p[v] = u; // build DFS-tree
            DFS_Visit(u);
        }
    color[u] = BLACK;
    time = time + 1; // global variable
    f[u] = time; // compute finishing time f[]
}
```

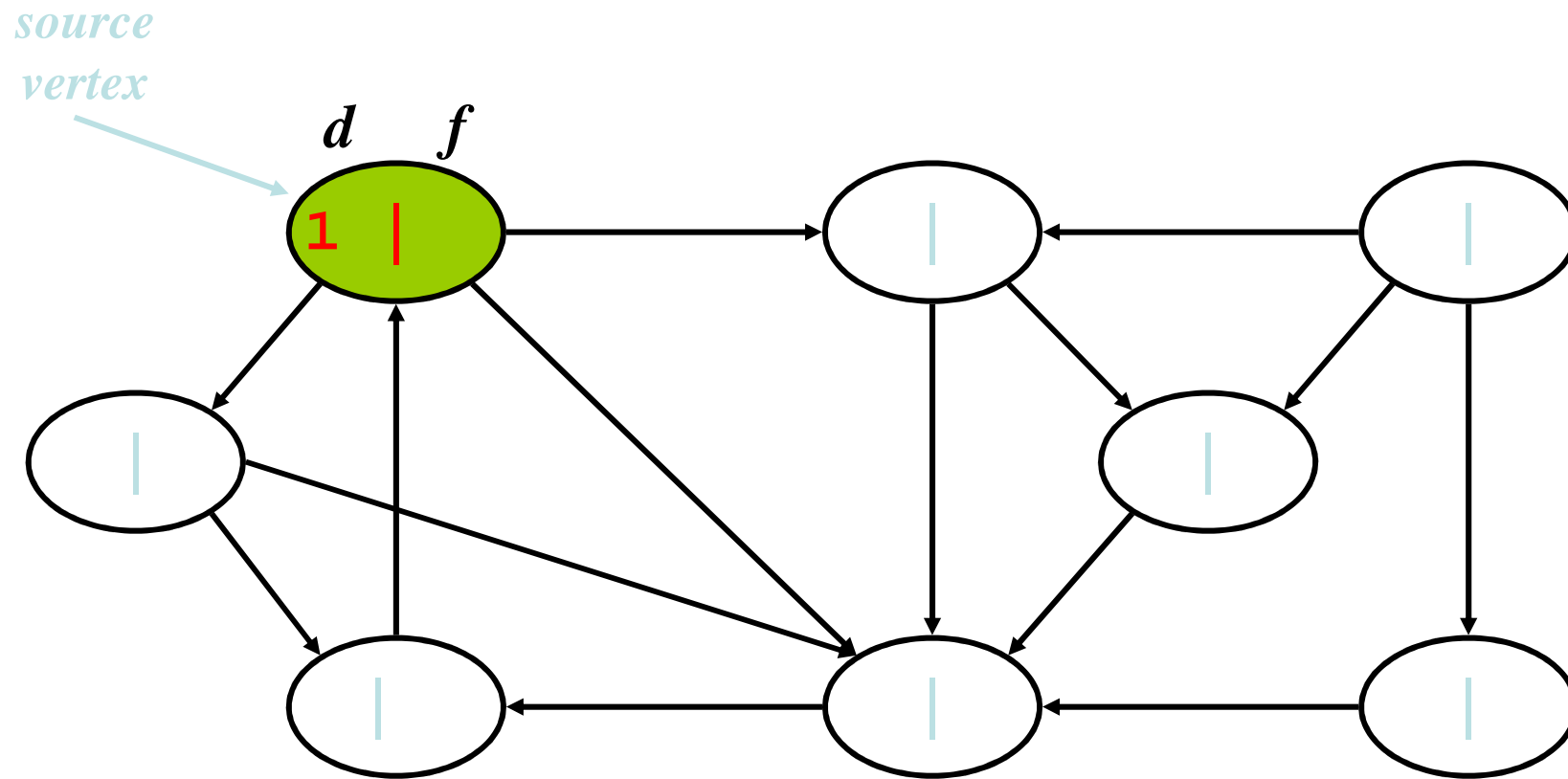
DFS runs in $O(V+E)$

DFS Example

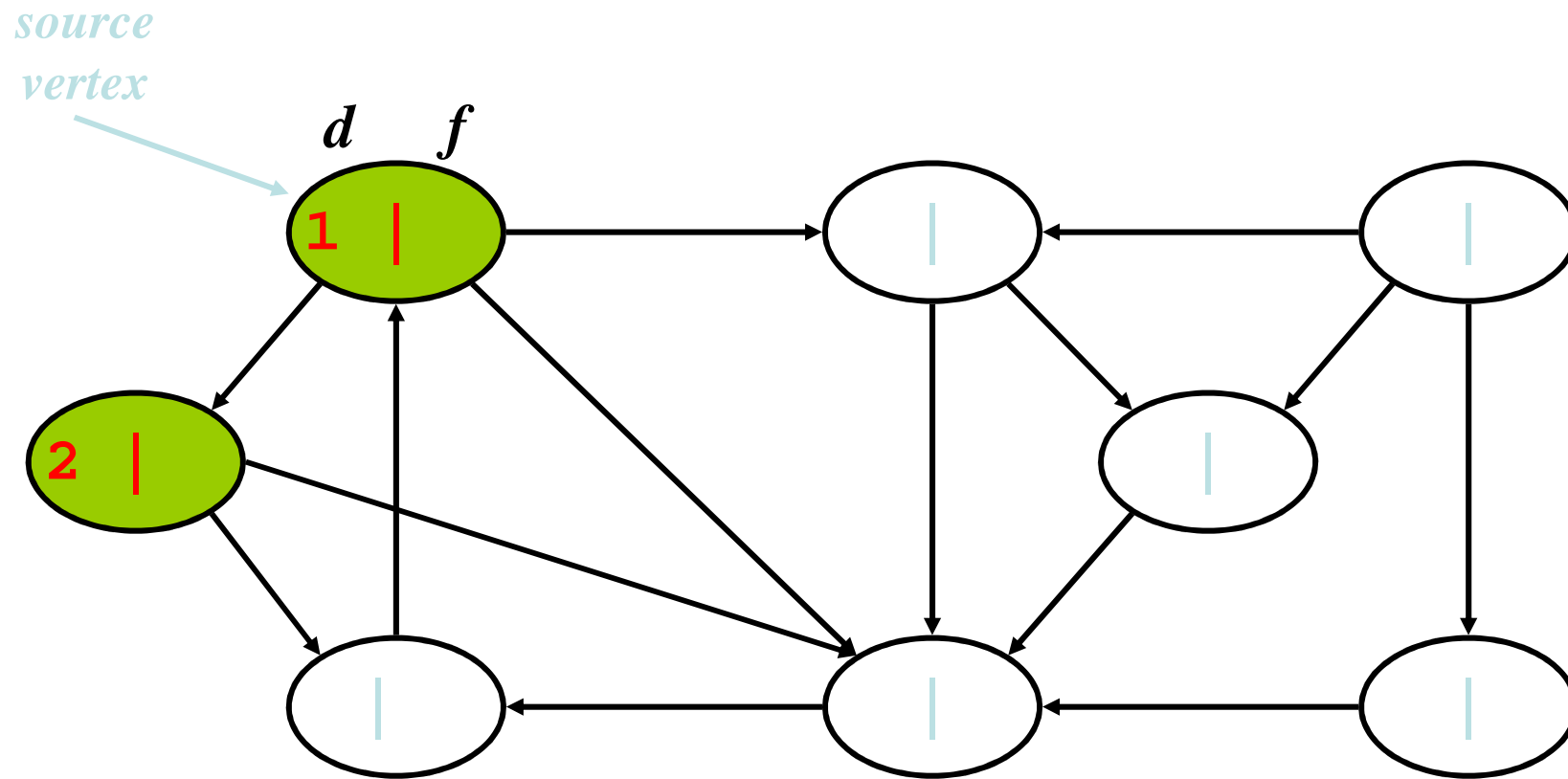
*source
vertex*



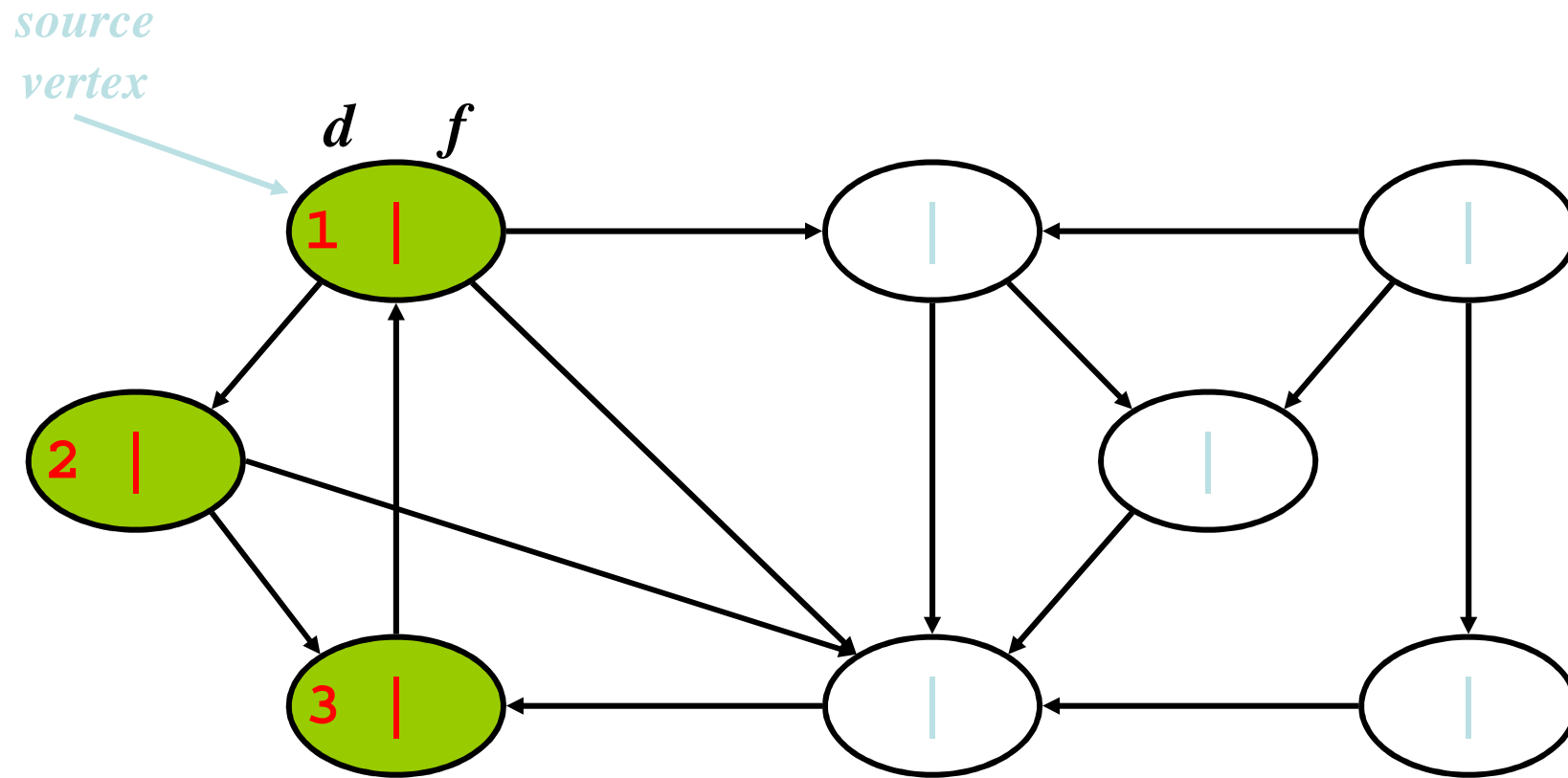
DFS Example



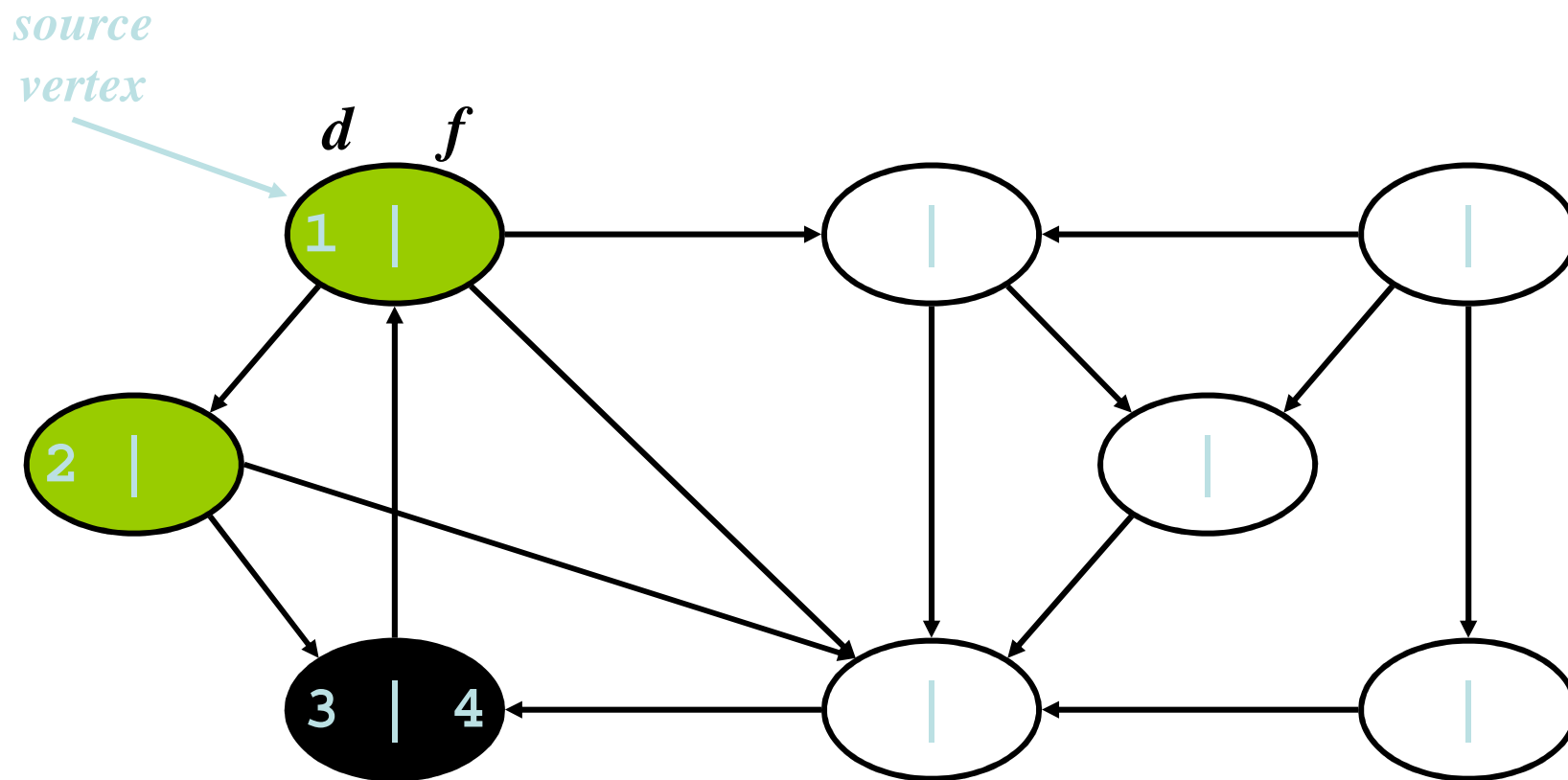
DFS Example



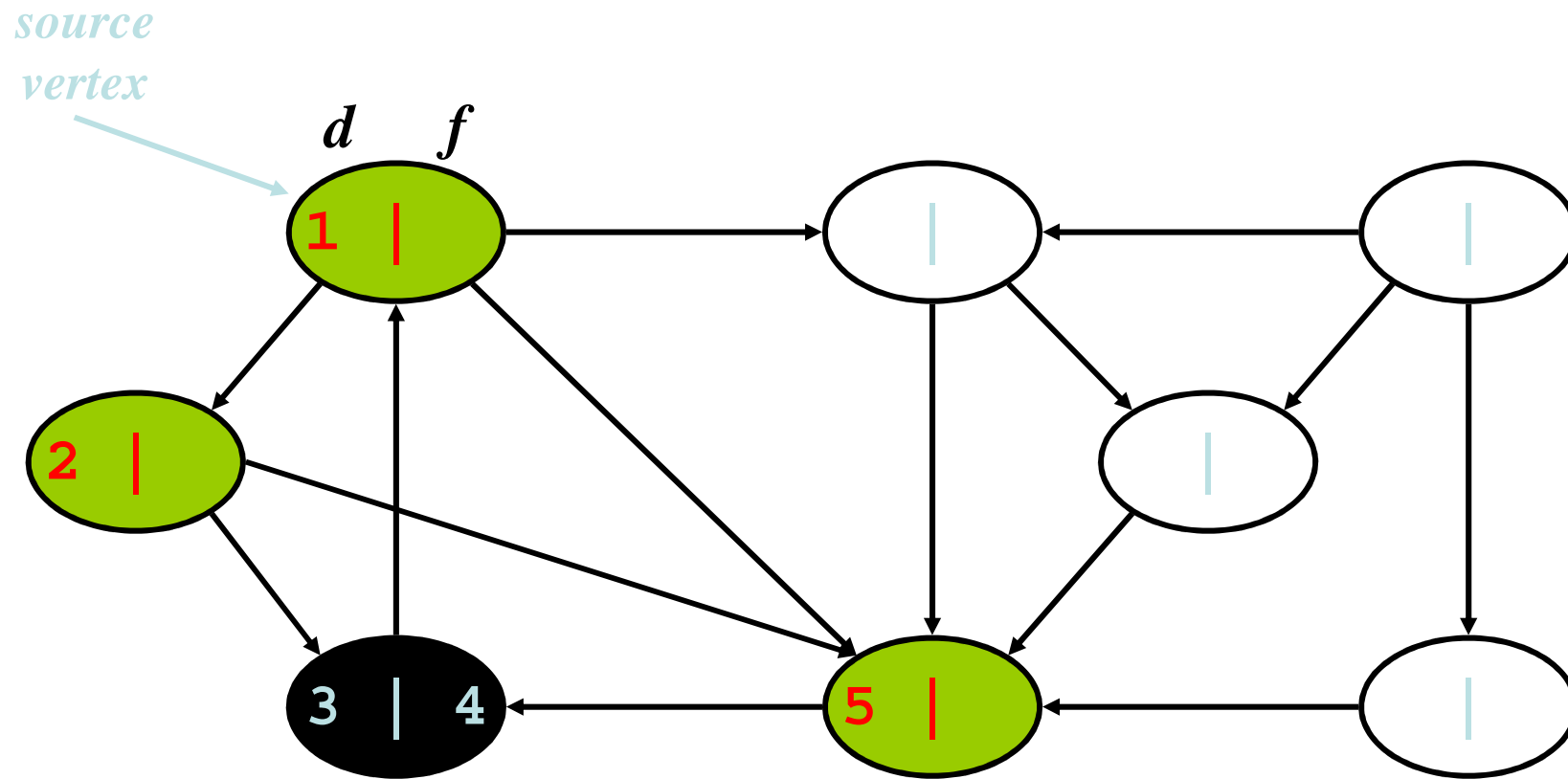
DFS Example



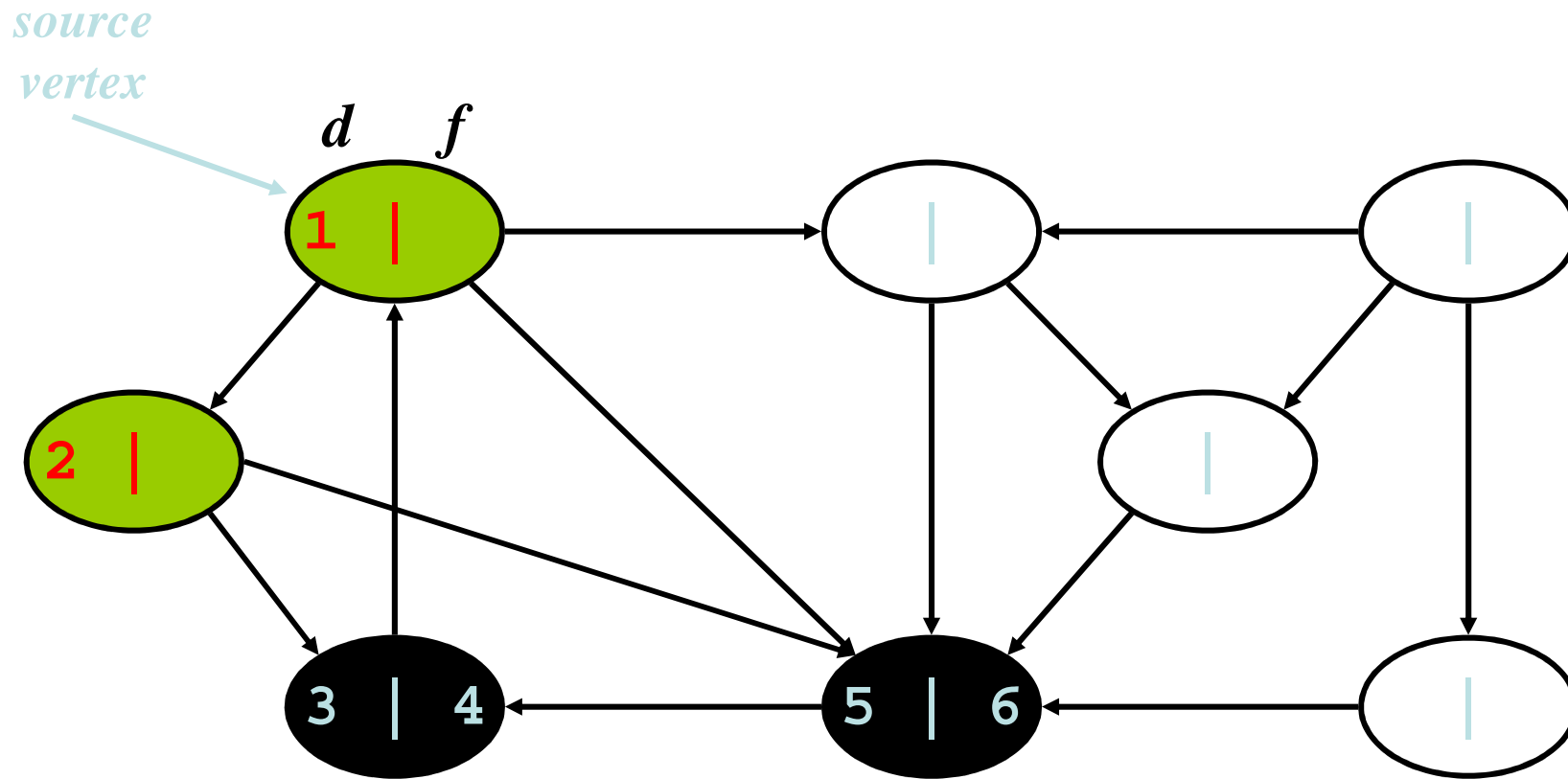
DFS Example



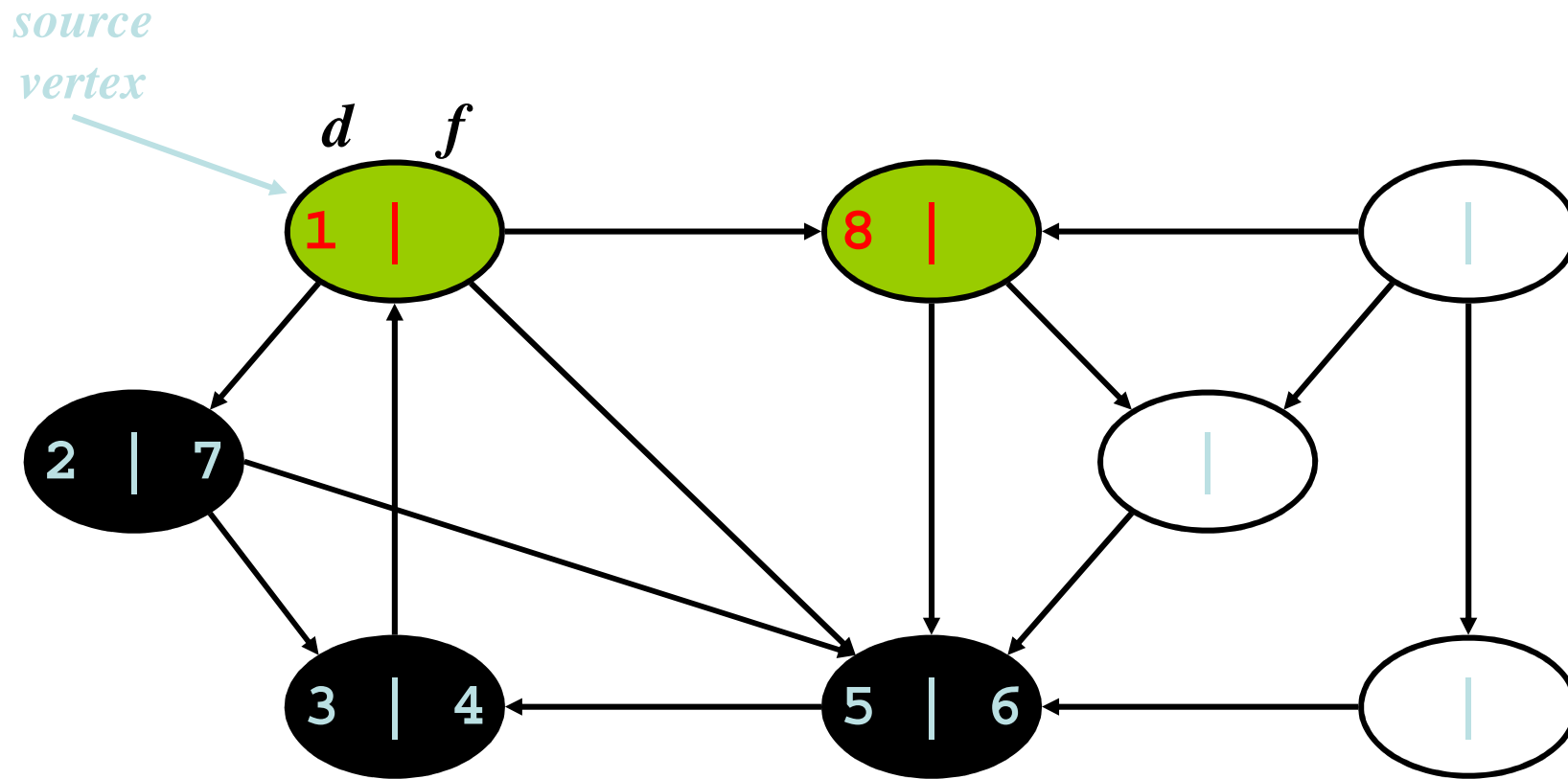
DFS Example



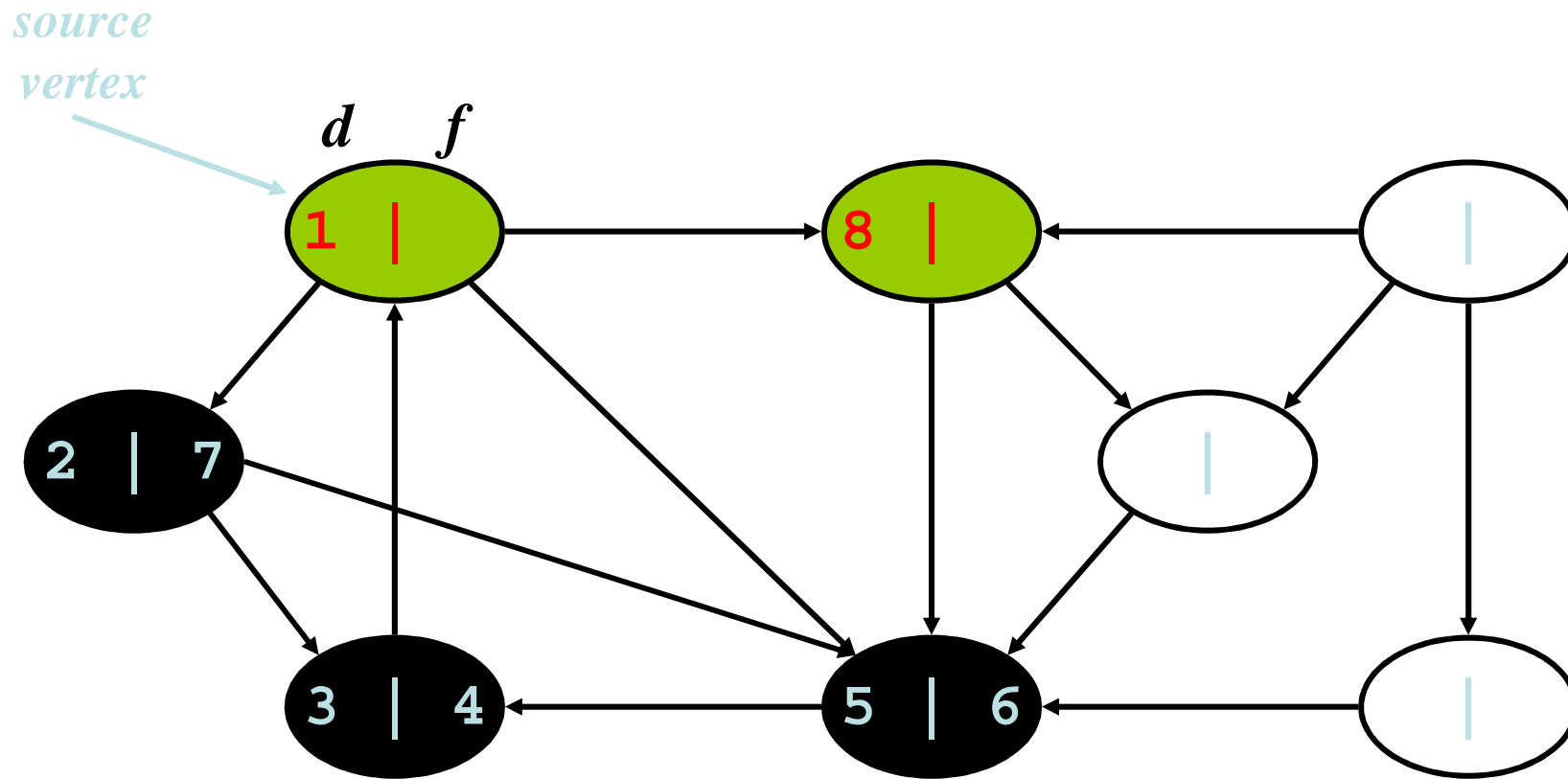
DFS Example



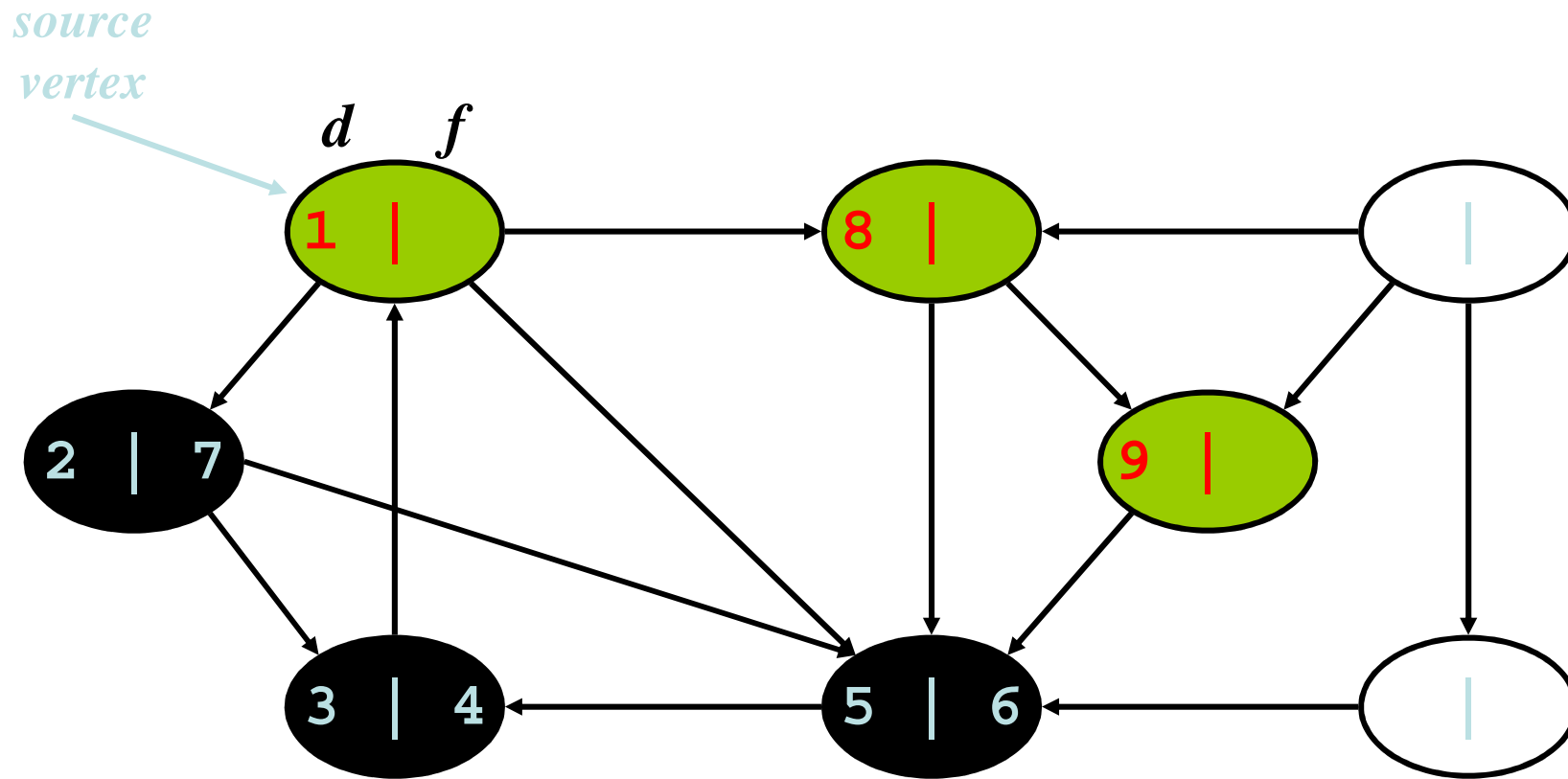
DFS Example



DFS Example

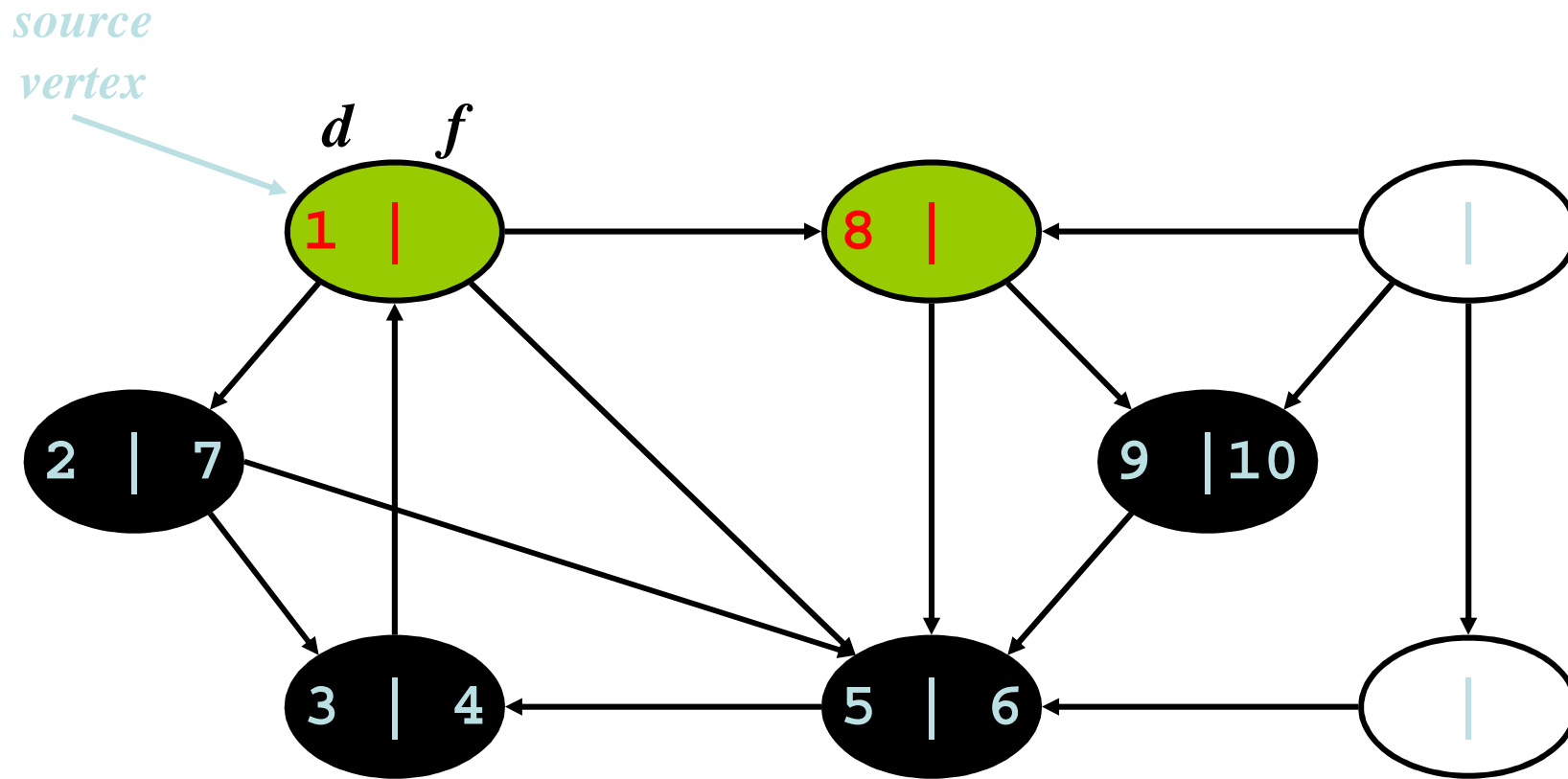


DFS Example

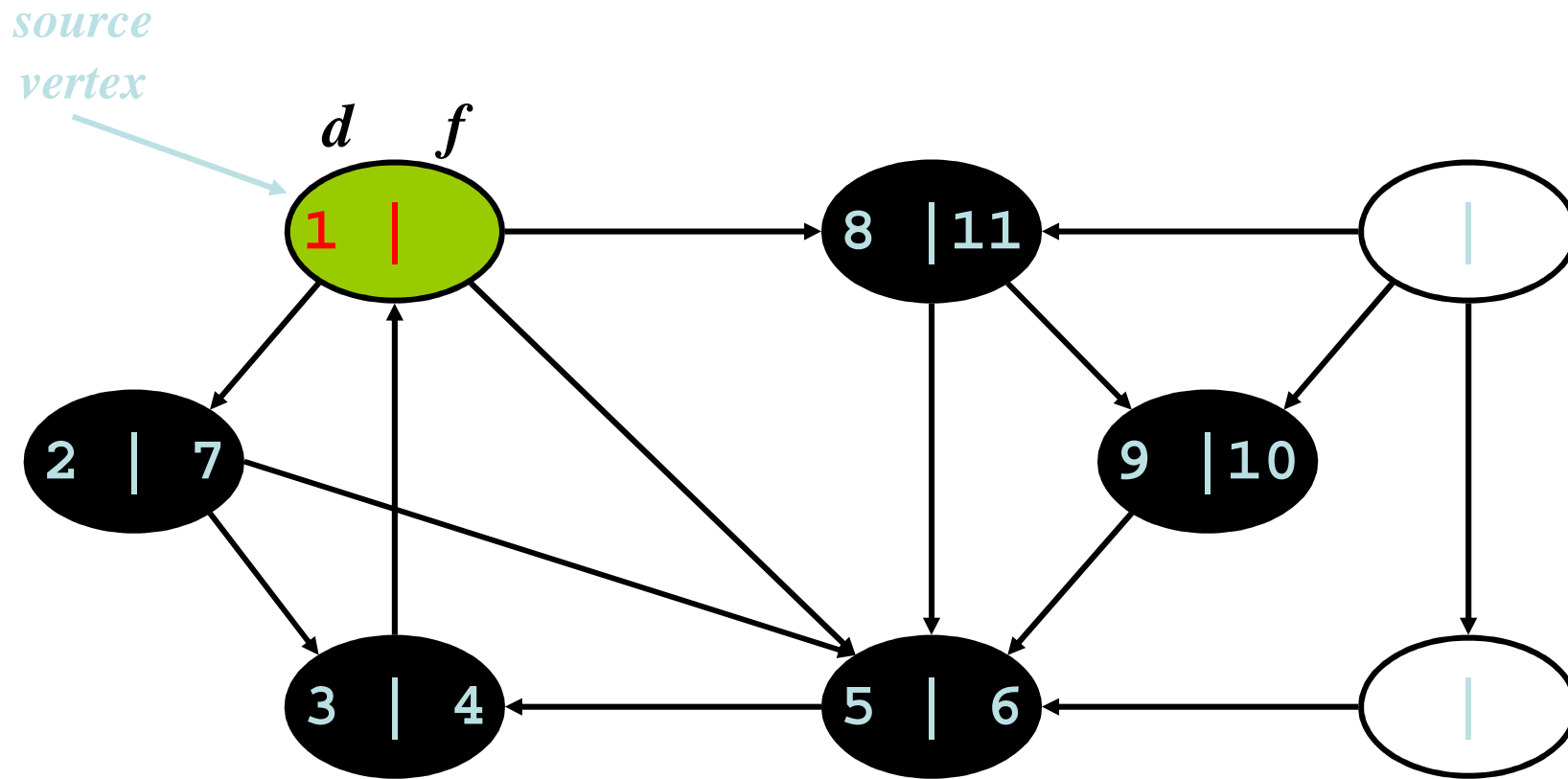


*What is the structure of the grey vertices?
What do they represent?*

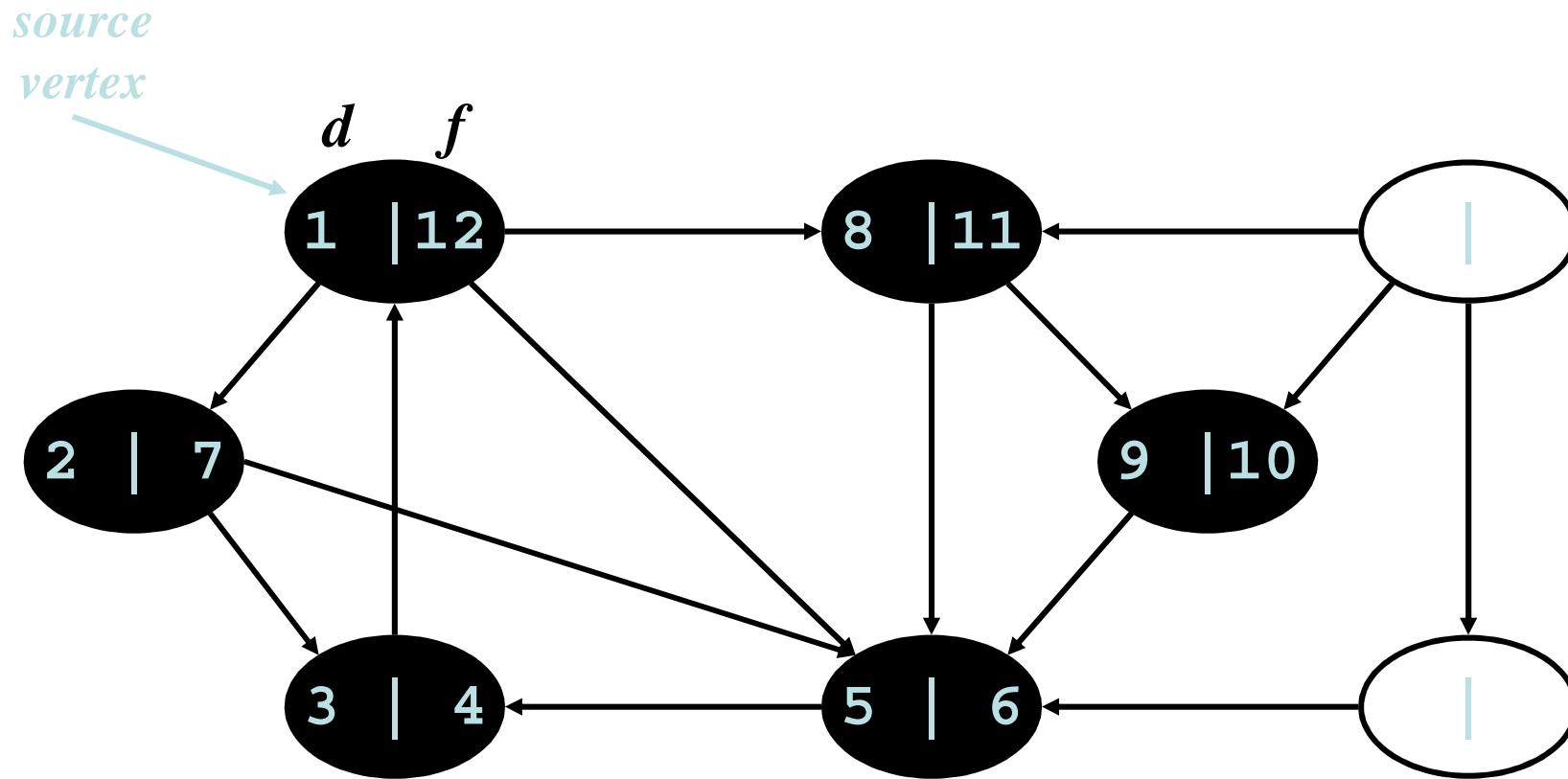
DFS Example



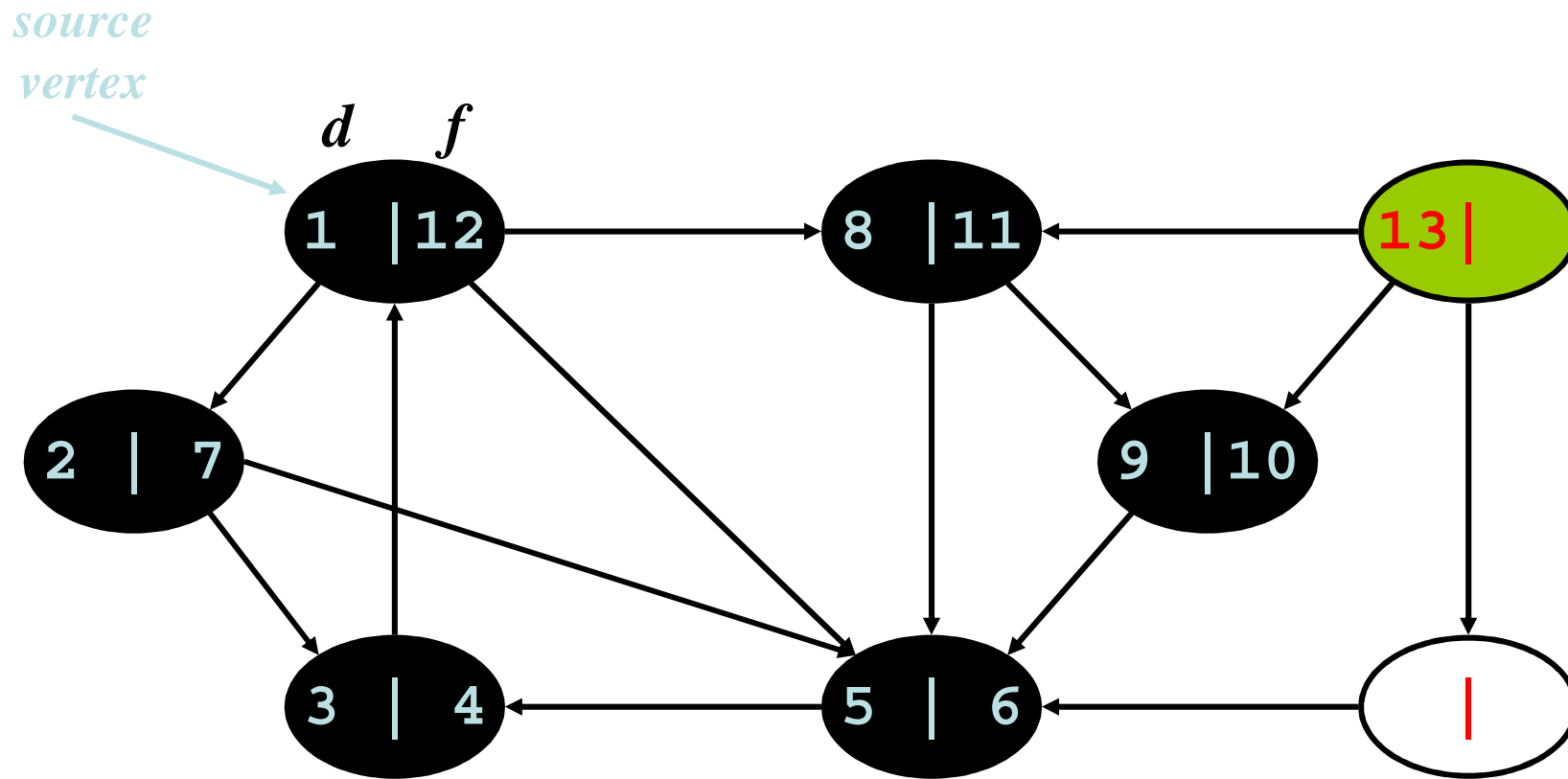
DFS Example



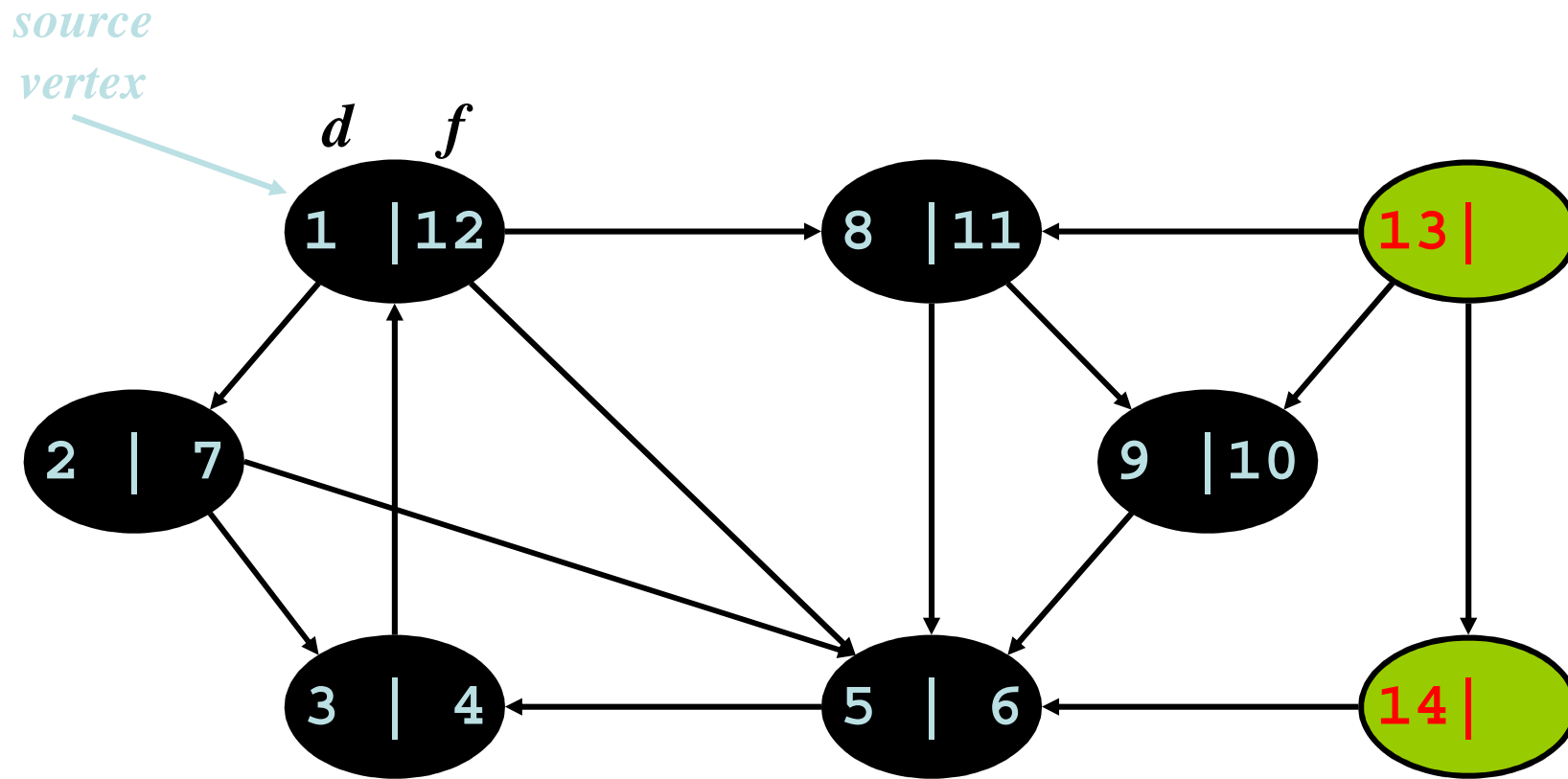
DFS Example



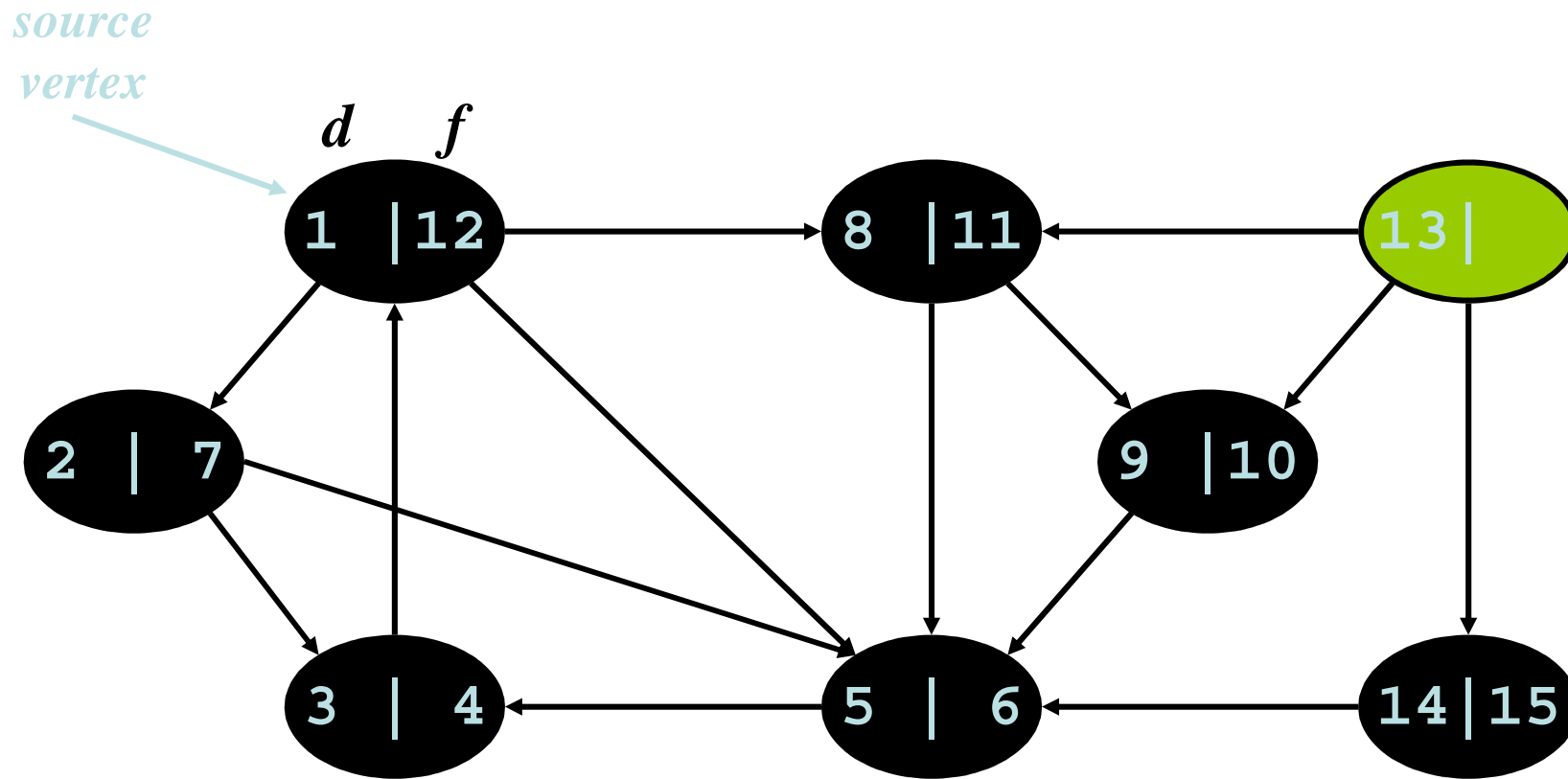
DFS Example



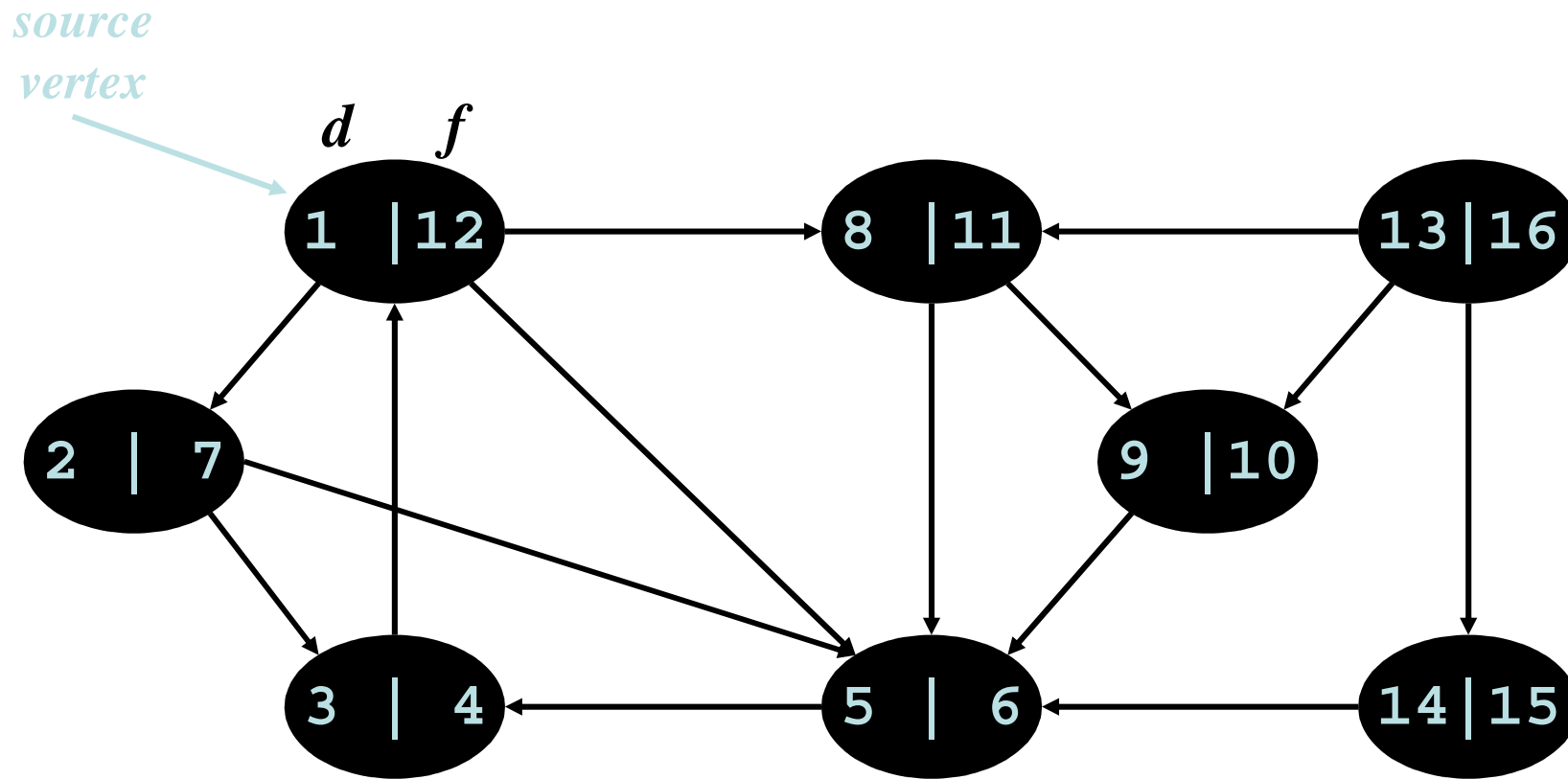
DFS Example



DFS Example



DFS Example



Wrestlers

- นักมวยปล้ำปรกติแล้วจะมีกลุ่มธรรมและอธรรม นักมวยปล้ำจะไม่สู้กันเองในกลุ่ม หากเรามีข้อมูลว่านักมวยปล้ำคนไหนแข่งกับใคร จงเขียนโปรแกรมแยกนักมวยปล้ำ n คนออกเป็นกลุ่มธรรมและอธรรม

Problems

- **#469 - Wetlands of Florida**
- <http://uva.onlinejudge.org/external/4/469.html>
- **#315 – Network**
- <http://uva.onlinejudge.org/external/3/315.html>
- **#539 The Settlers of Catan**
- <http://uva.onlinejudge.org/external/5/539.html>