

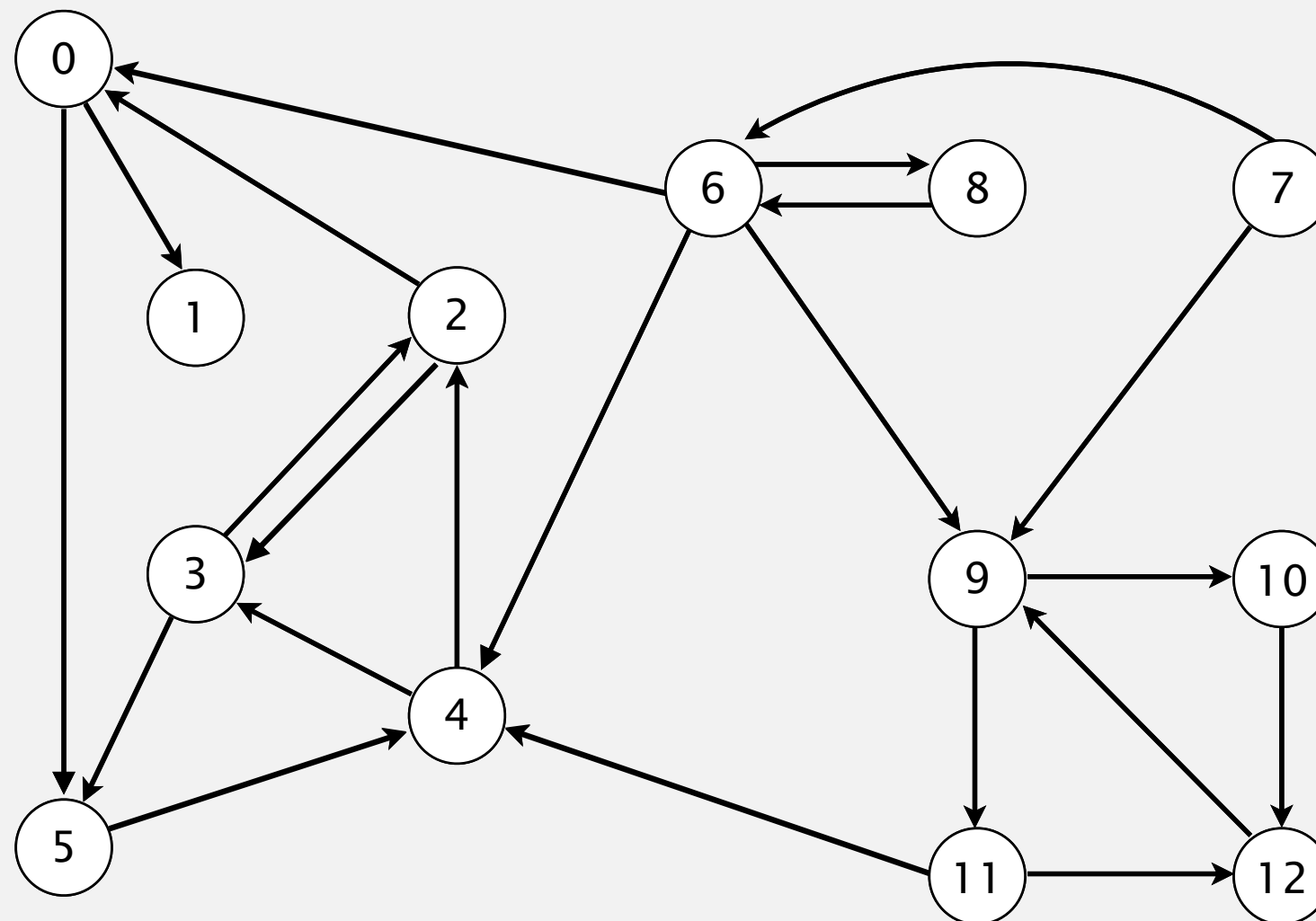
KOSARAJU-SHARIR ALGORITHM

Text

click to begin demo

Phase 1. Compute reverse postorder in G^R .

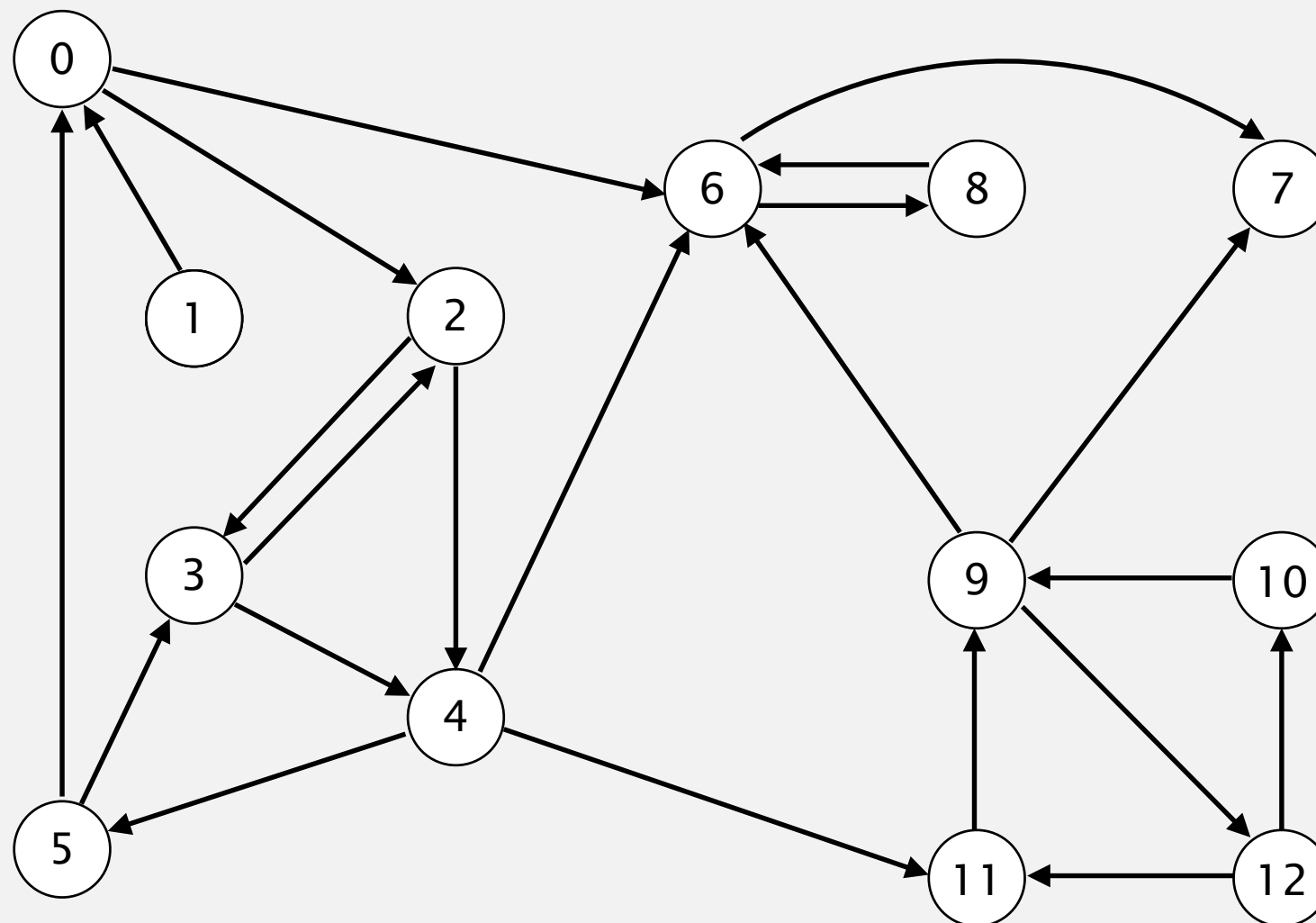
Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .



digraph G

- ▶ DFS in reverse graph
- ▶ DFS in original graph

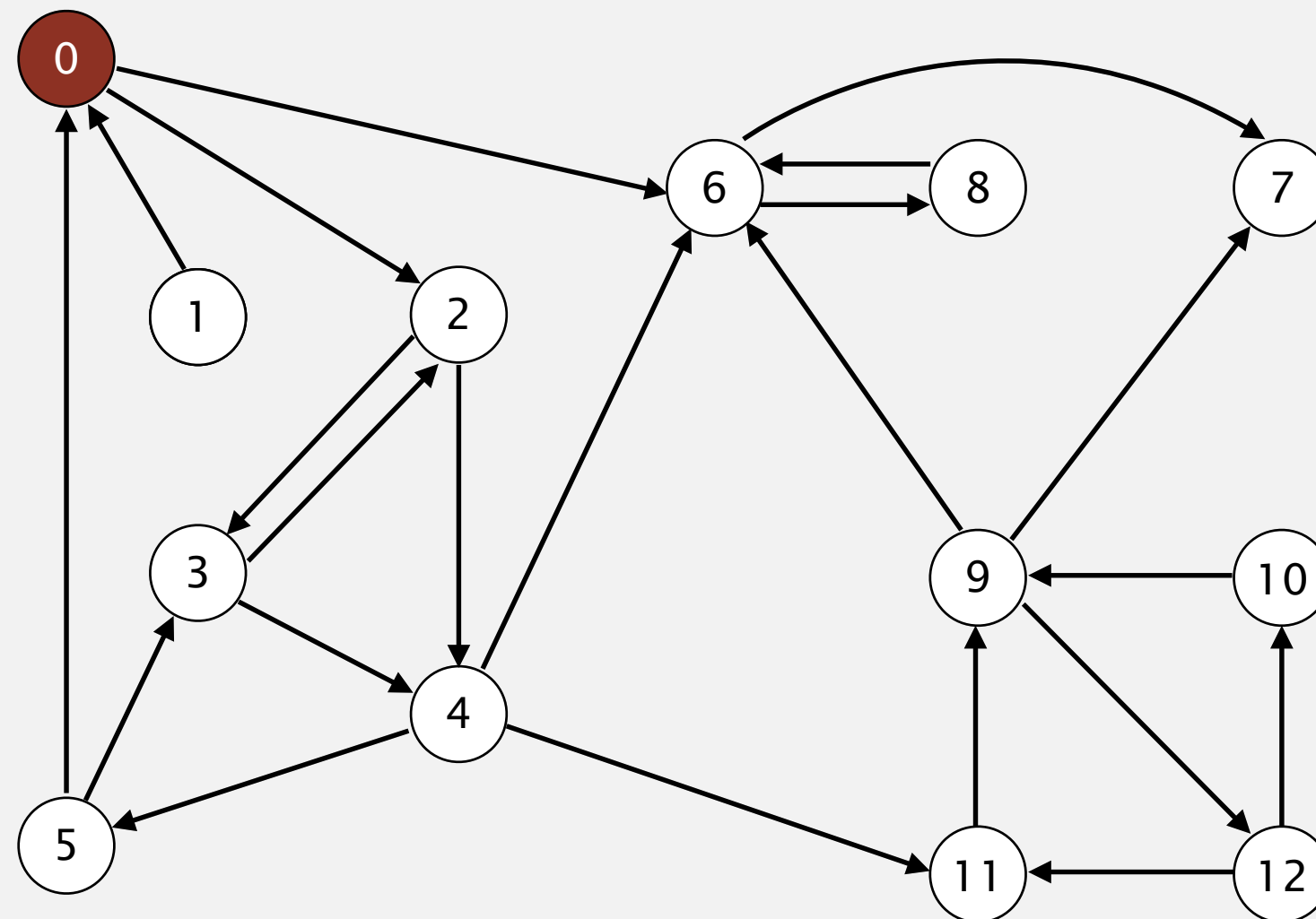
Phase 1. Compute reverse postorder in G^R .



reverse digraph G^R

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

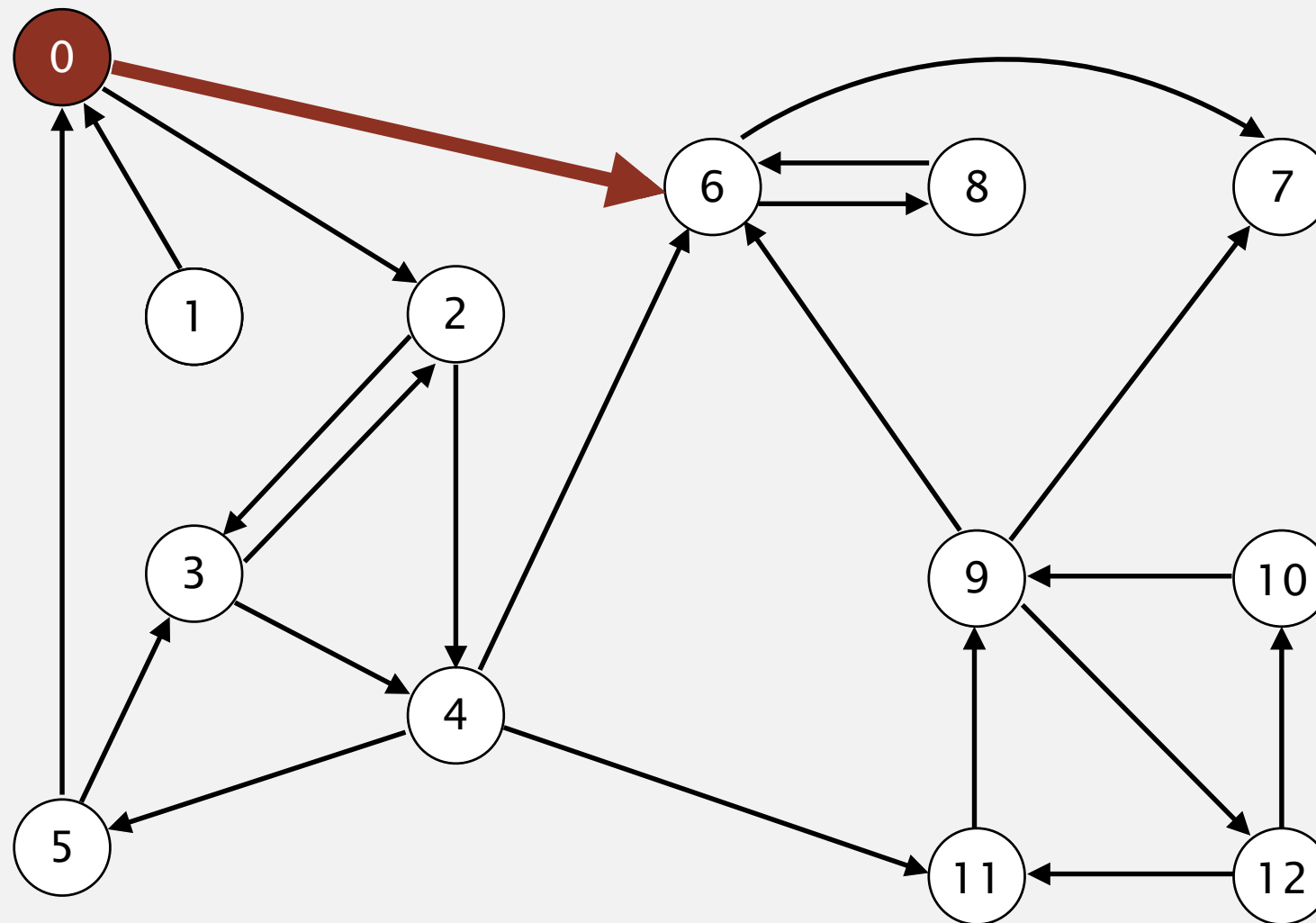
Phase 1. Compute reverse postorder in G^R .



visit 0

| v | marked[v] |
|----|-----------|
| 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 |

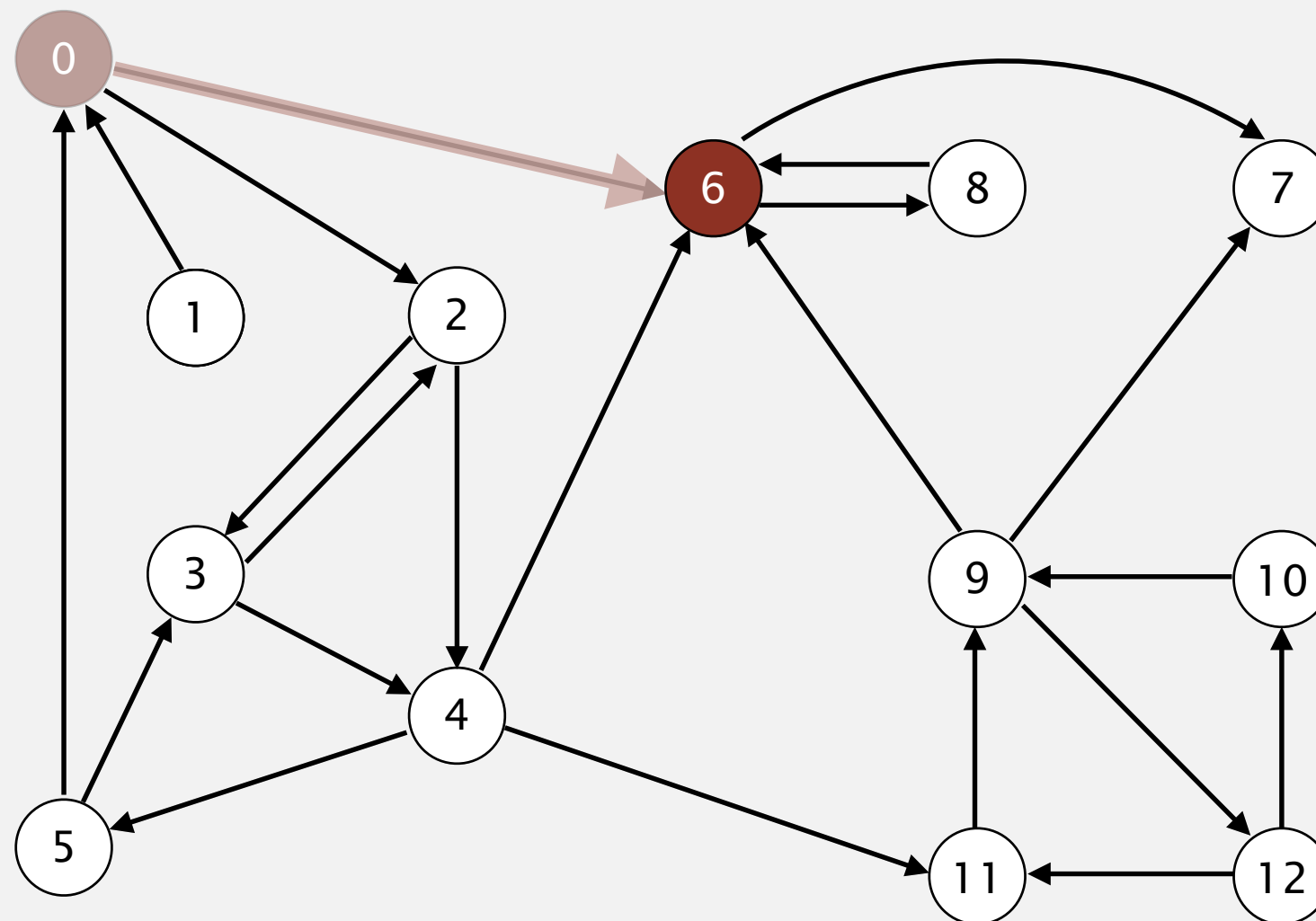
Phase 1. Compute reverse postorder in G^R .



visit 0

| v | marked[v] |
|----|-----------|
| 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 |

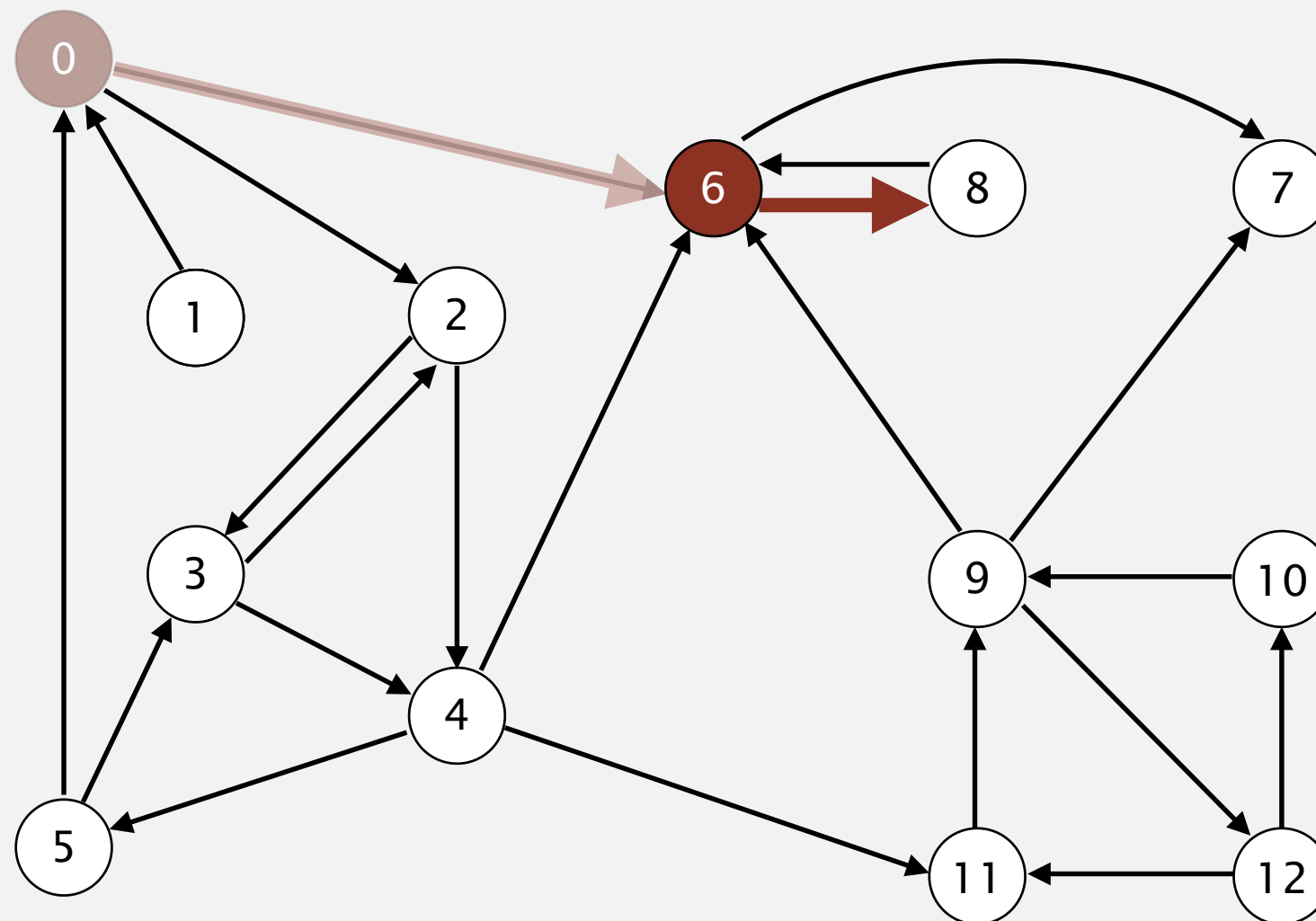
Phase 1. Compute reverse postorder in G^R .



visit 6

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

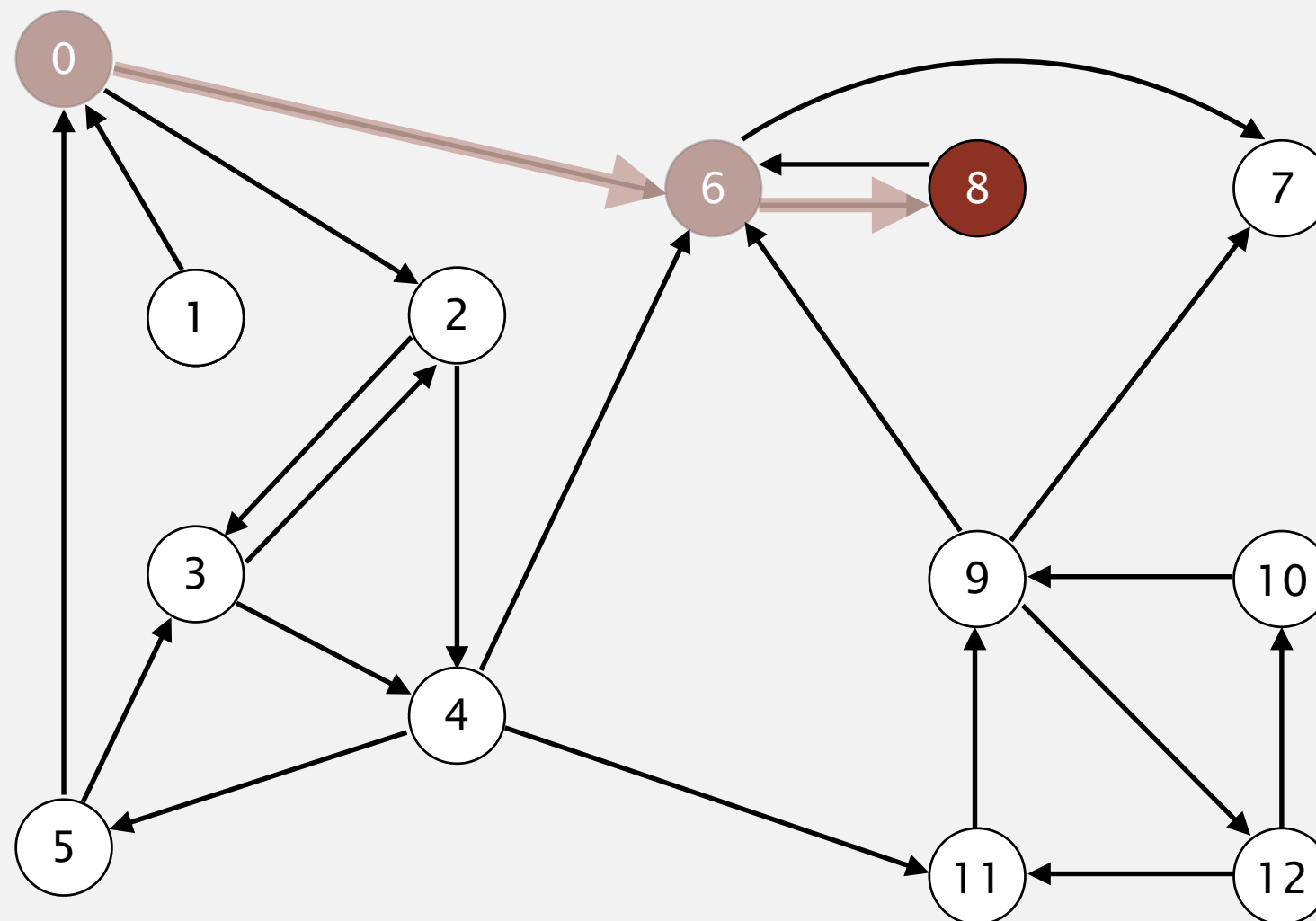
Phase 1. Compute reverse postorder in G^R .



visit 6

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

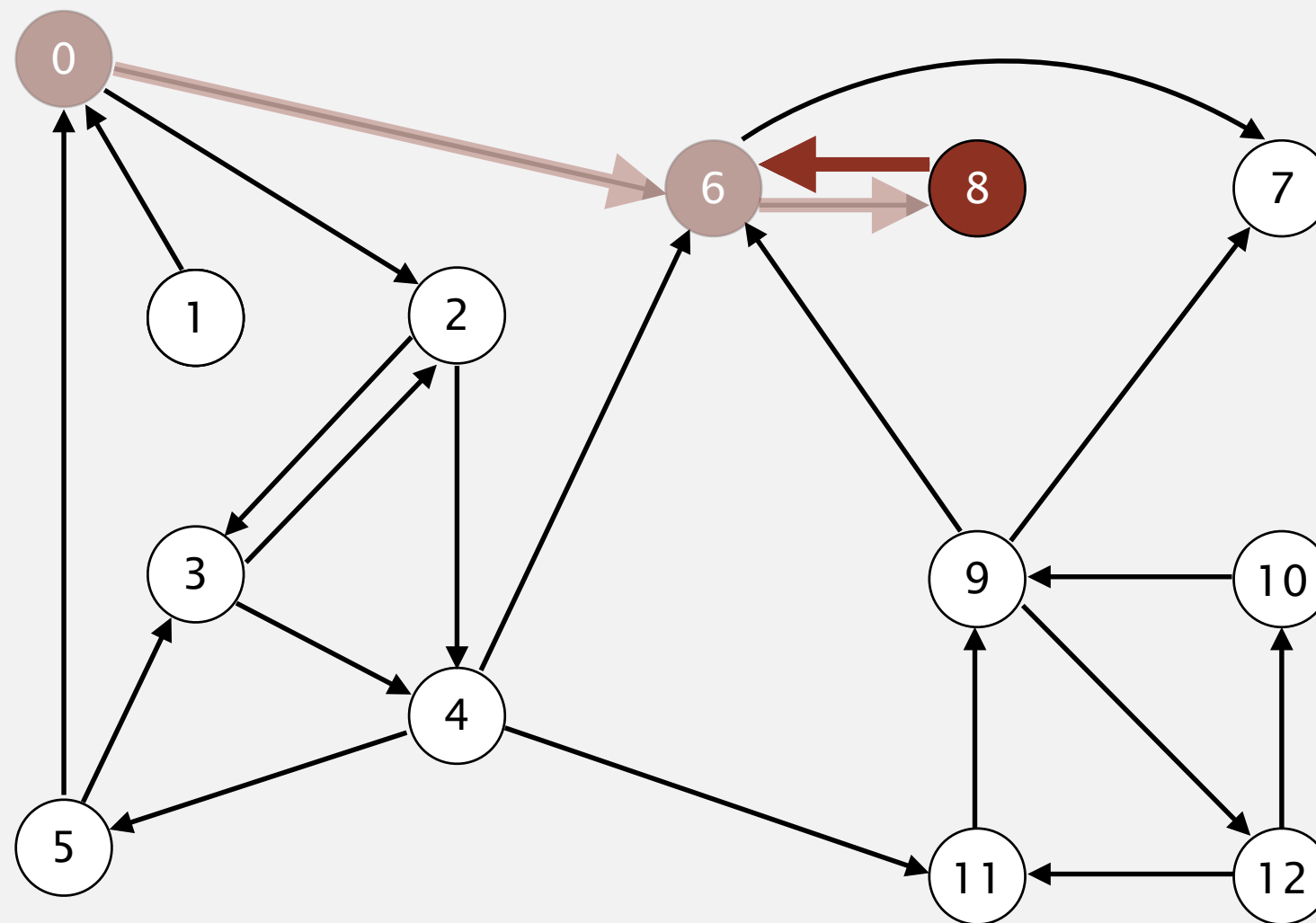
Phase 1. Compute reverse postorder in G^R .



visit 8

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

Phase 1. Compute reverse postorder in G^R .

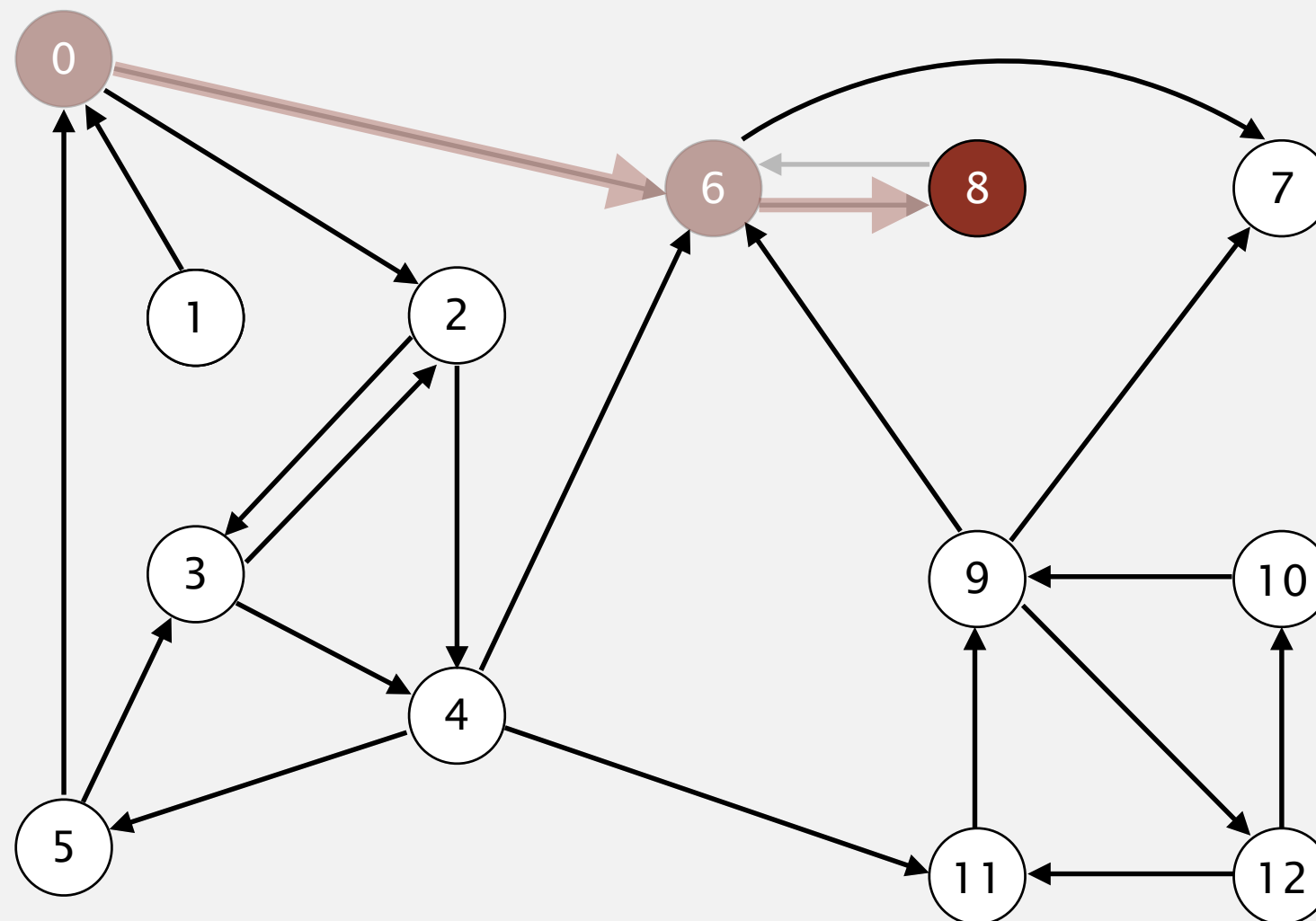


| v | marked[v] |
|----|-----------|
| 0 | T |
| 1 | F |
| 2 | F |
| 3 | F |
| 4 | F |
| 5 | F |
| 6 | T |
| 7 | F |
| 8 | T |
| 9 | F |
| 10 | F |
| 11 | F |
| 12 | F |

visit 8

Phase 1. Compute reverse postorder in G^R .

8

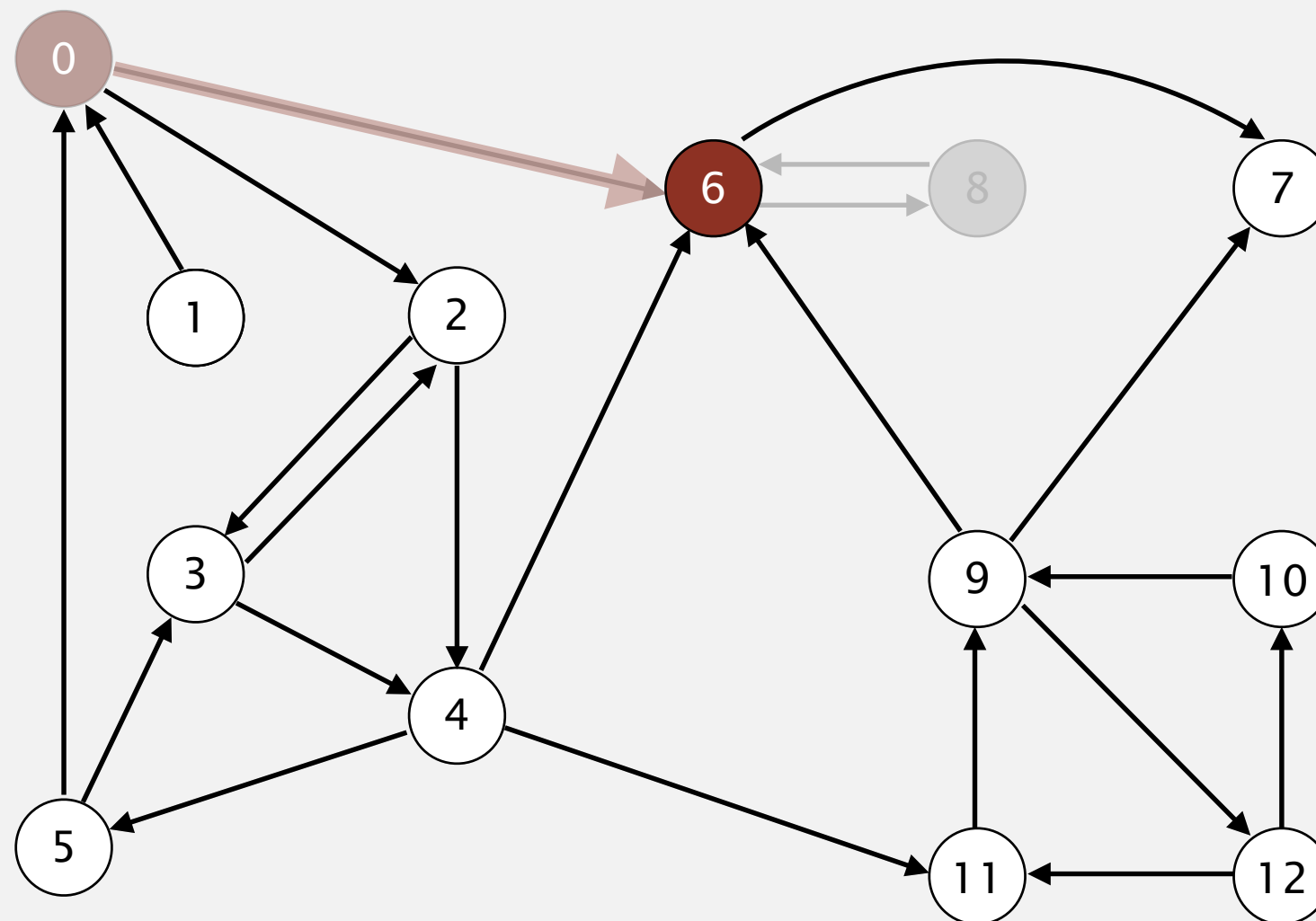


8 done

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

Phase 1. Compute reverse postorder in G^R .

8

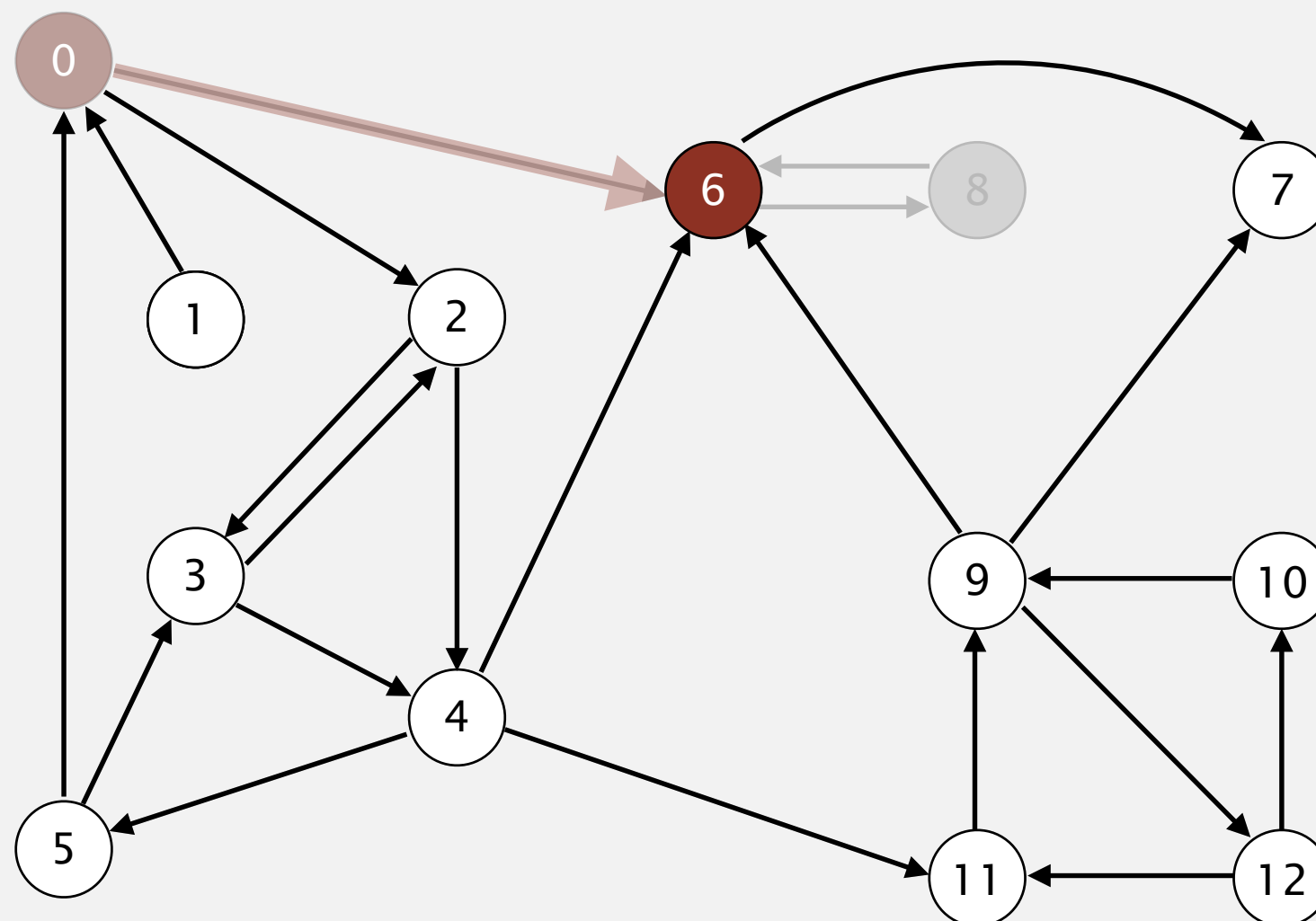


8 done

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

Phase 1. Compute reverse postorder in G^R .

8

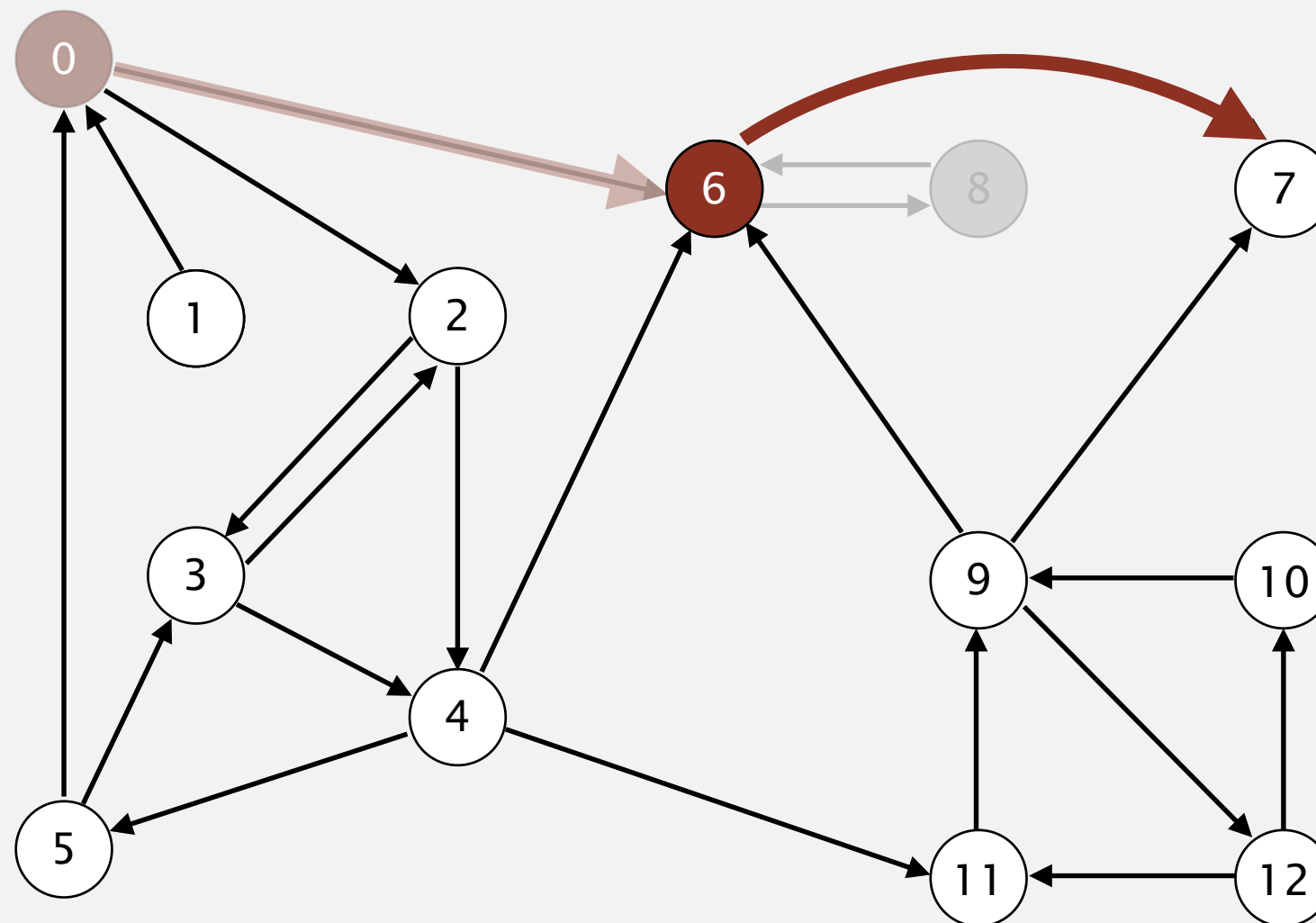


visit 6

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

Phase 1. Compute reverse postorder in G^R .

8

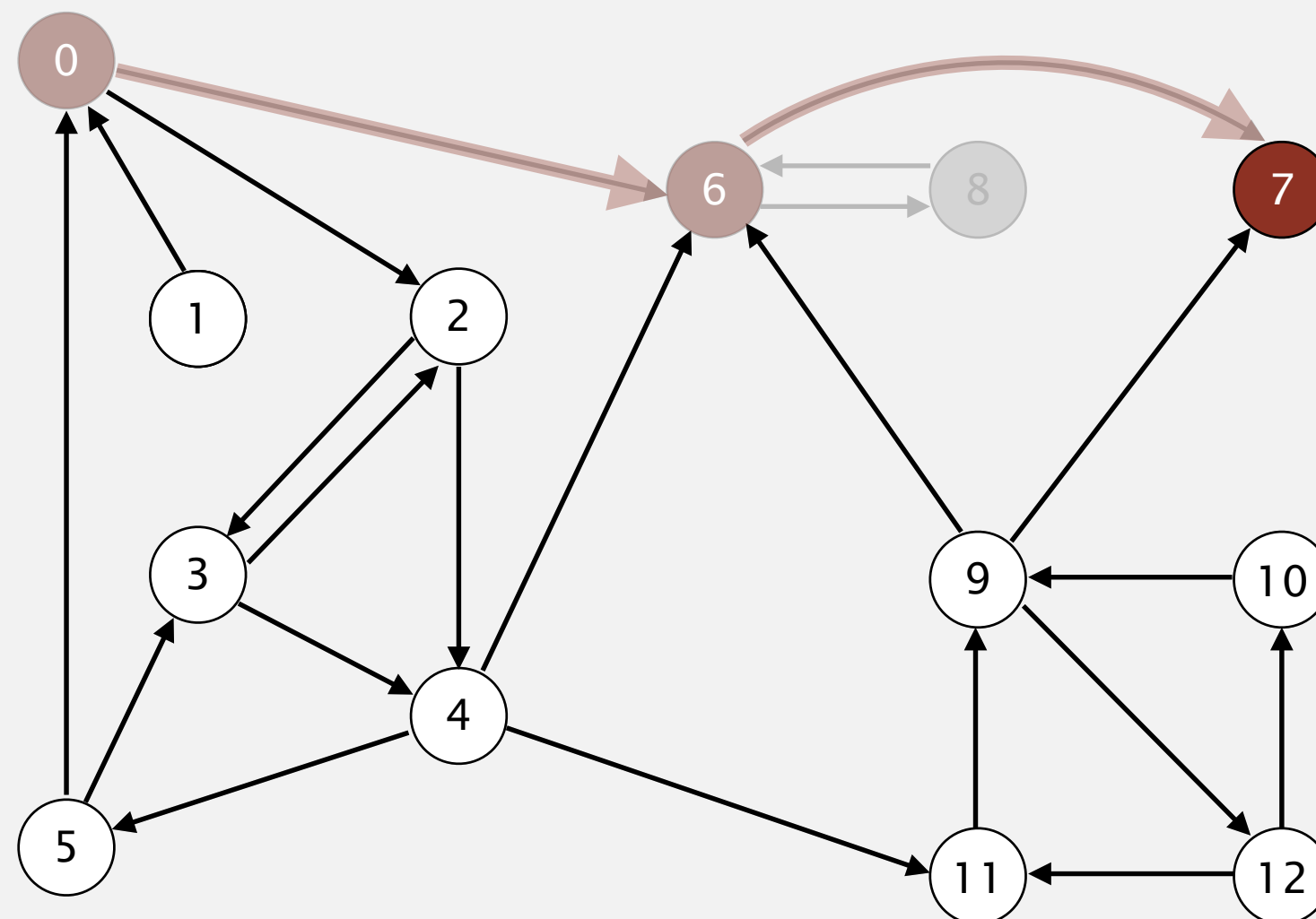


visit 6

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

Phase 1. Compute reverse postorder in G^R .

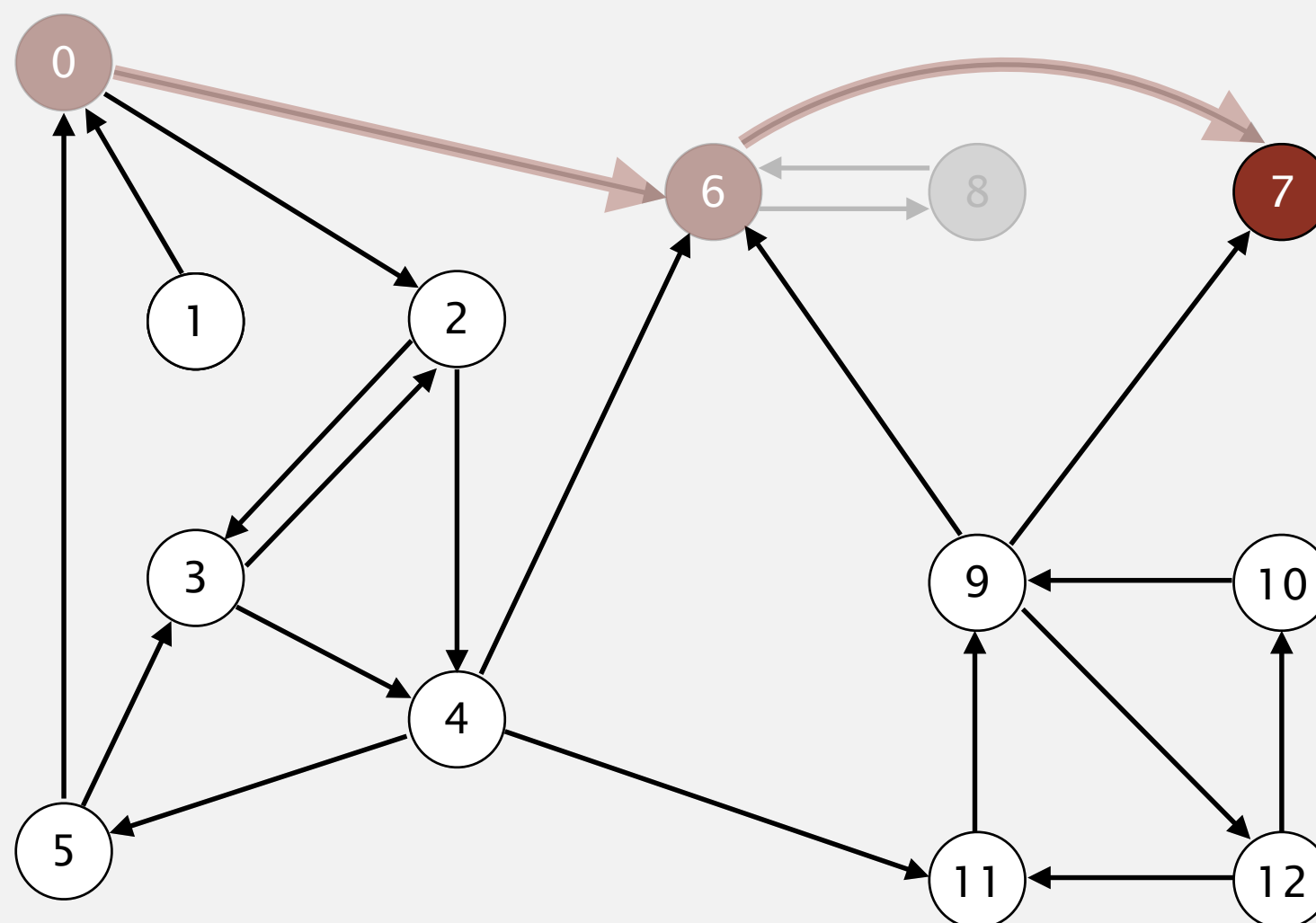
8



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

Phase 1. Compute reverse postorder in G^R .

7 8

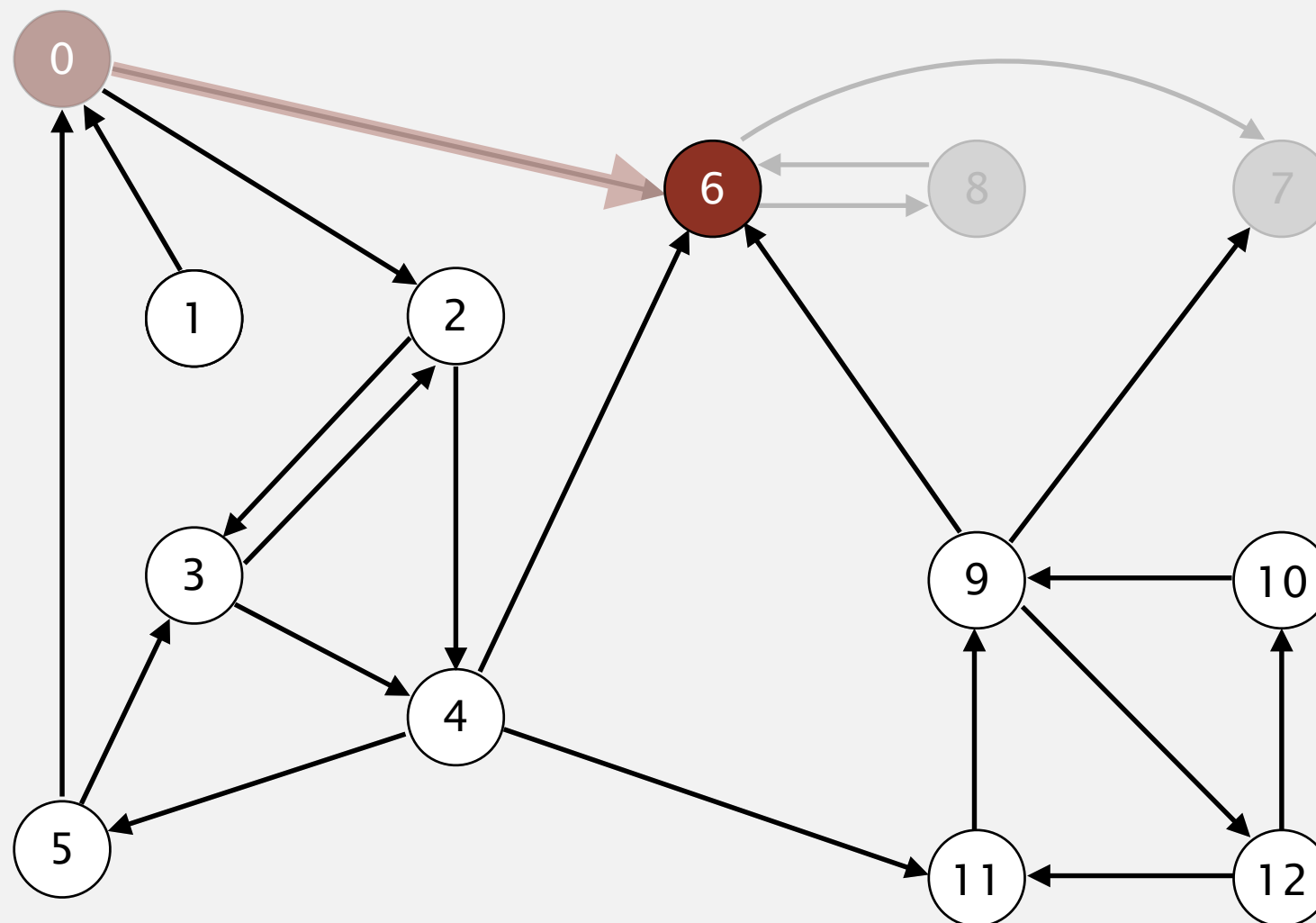


7 done

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

Phase 1. Compute reverse postorder in G^R .

7 8

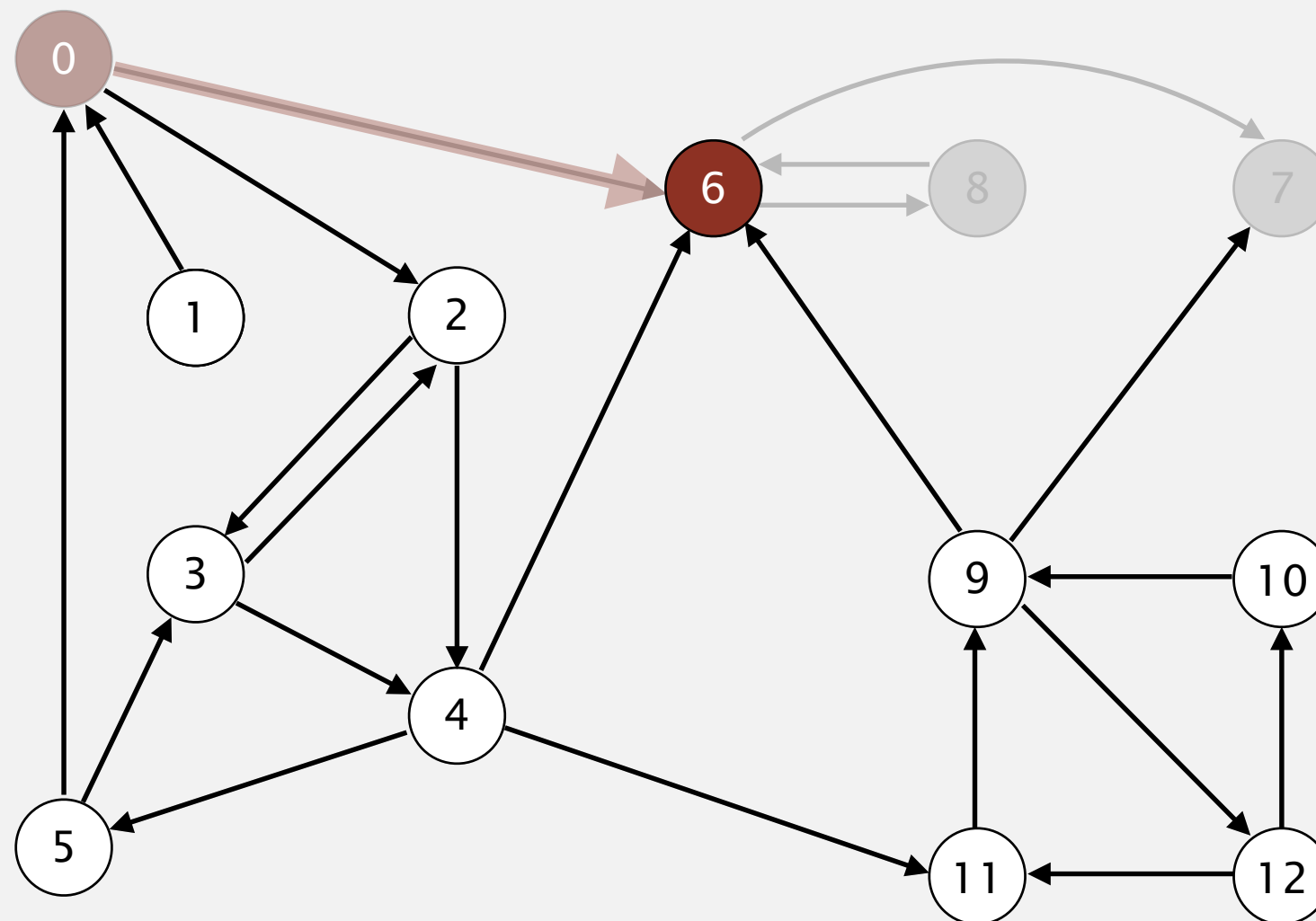


7 done

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

Phase 1. Compute reverse postorder in G^R .

6 7 8

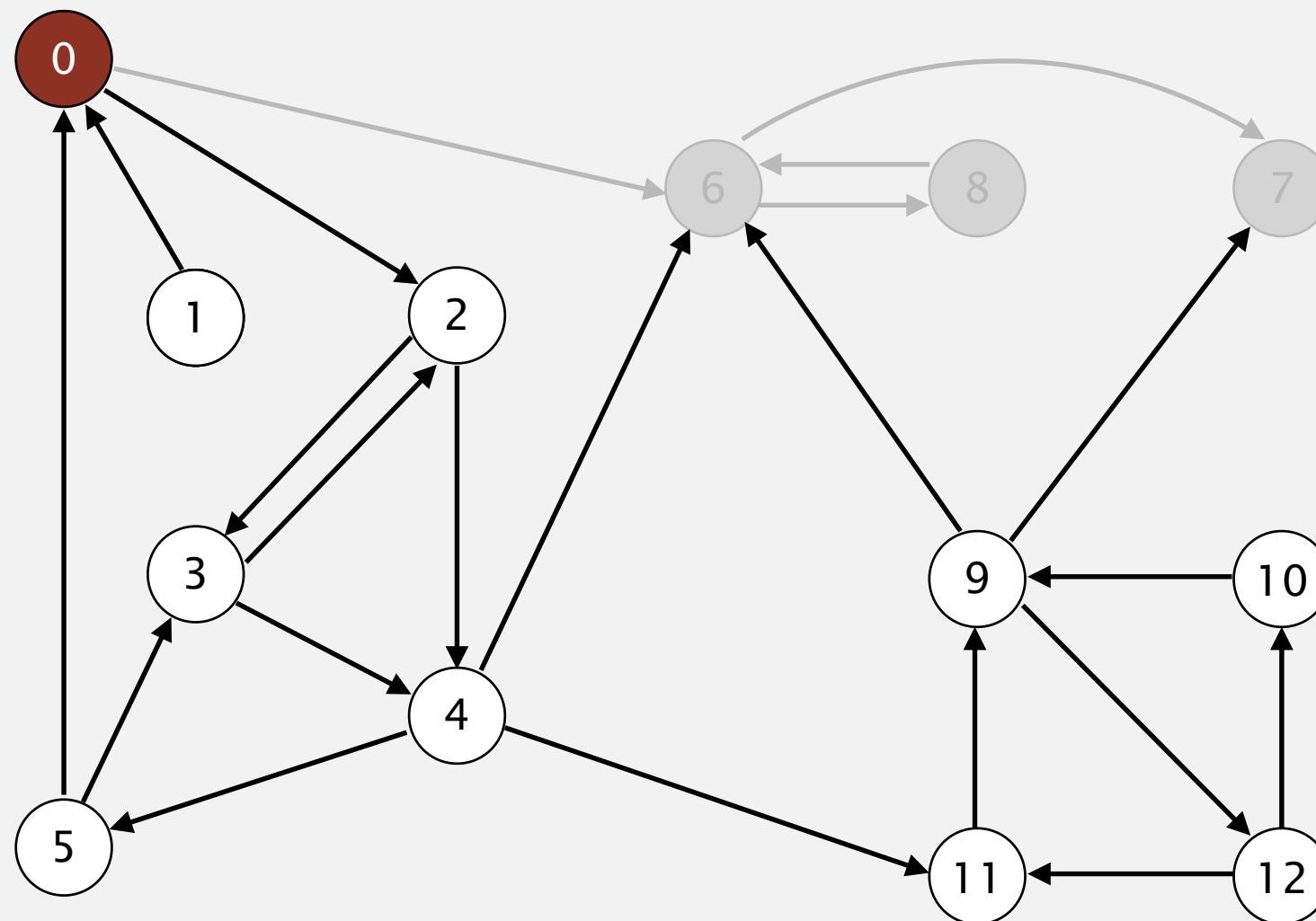


6 done

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

Phase 1. Compute reverse postorder in G^R .

6 7 8

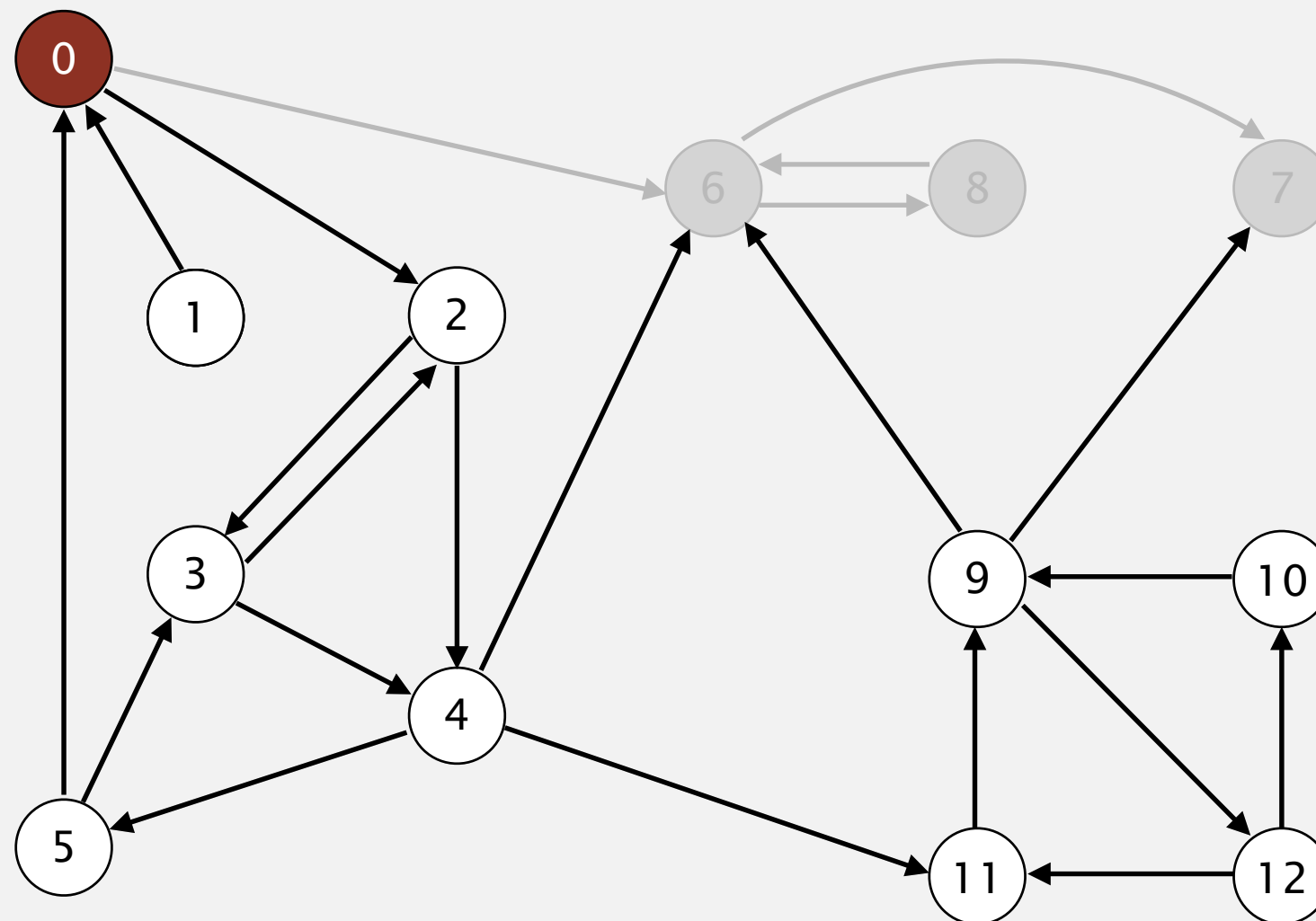


6 done

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

Phase 1. Compute reverse postorder in G^R .

6 7 8

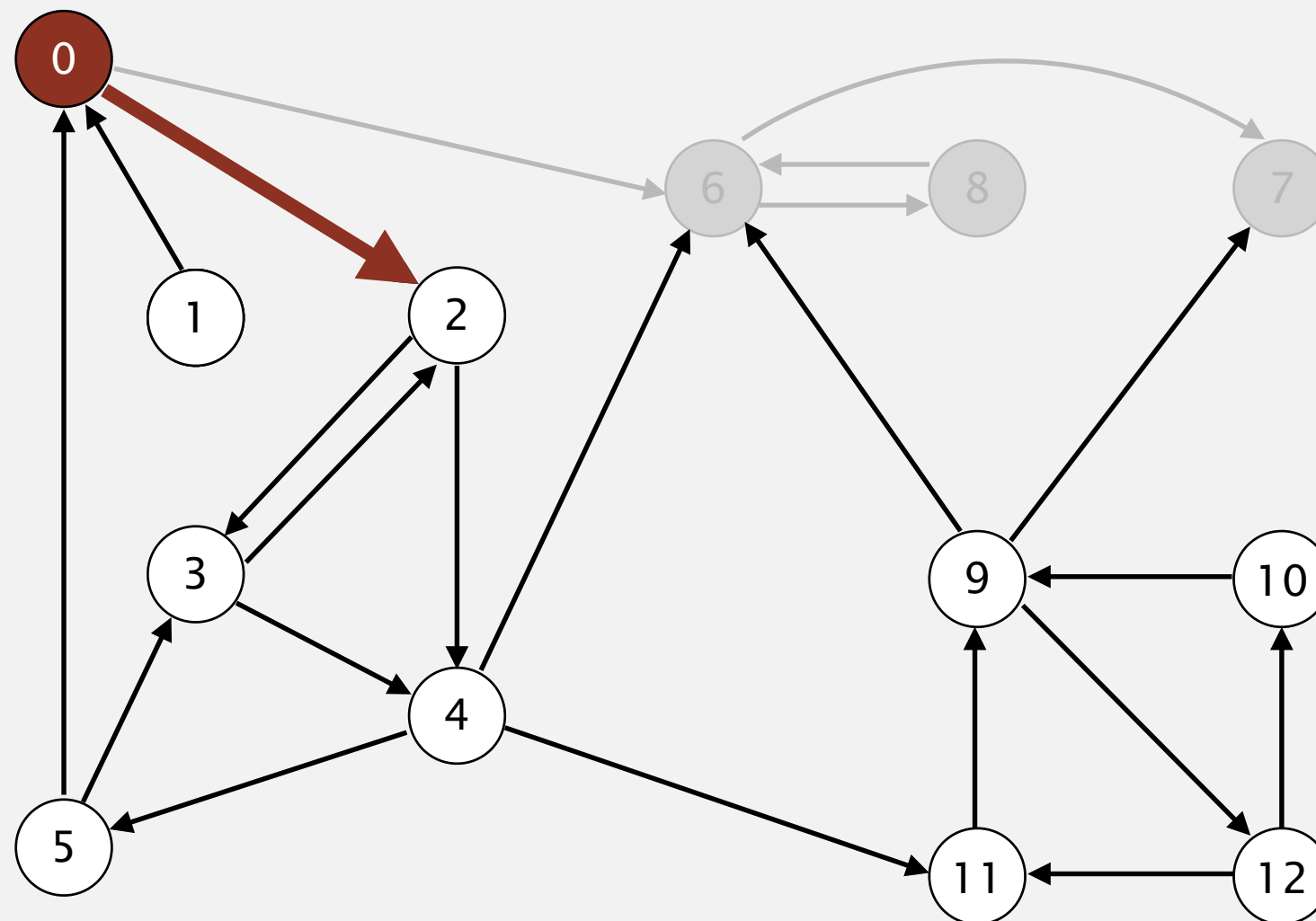


visit 0

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

Phase 1. Compute reverse postorder in G^R .

6 7 8

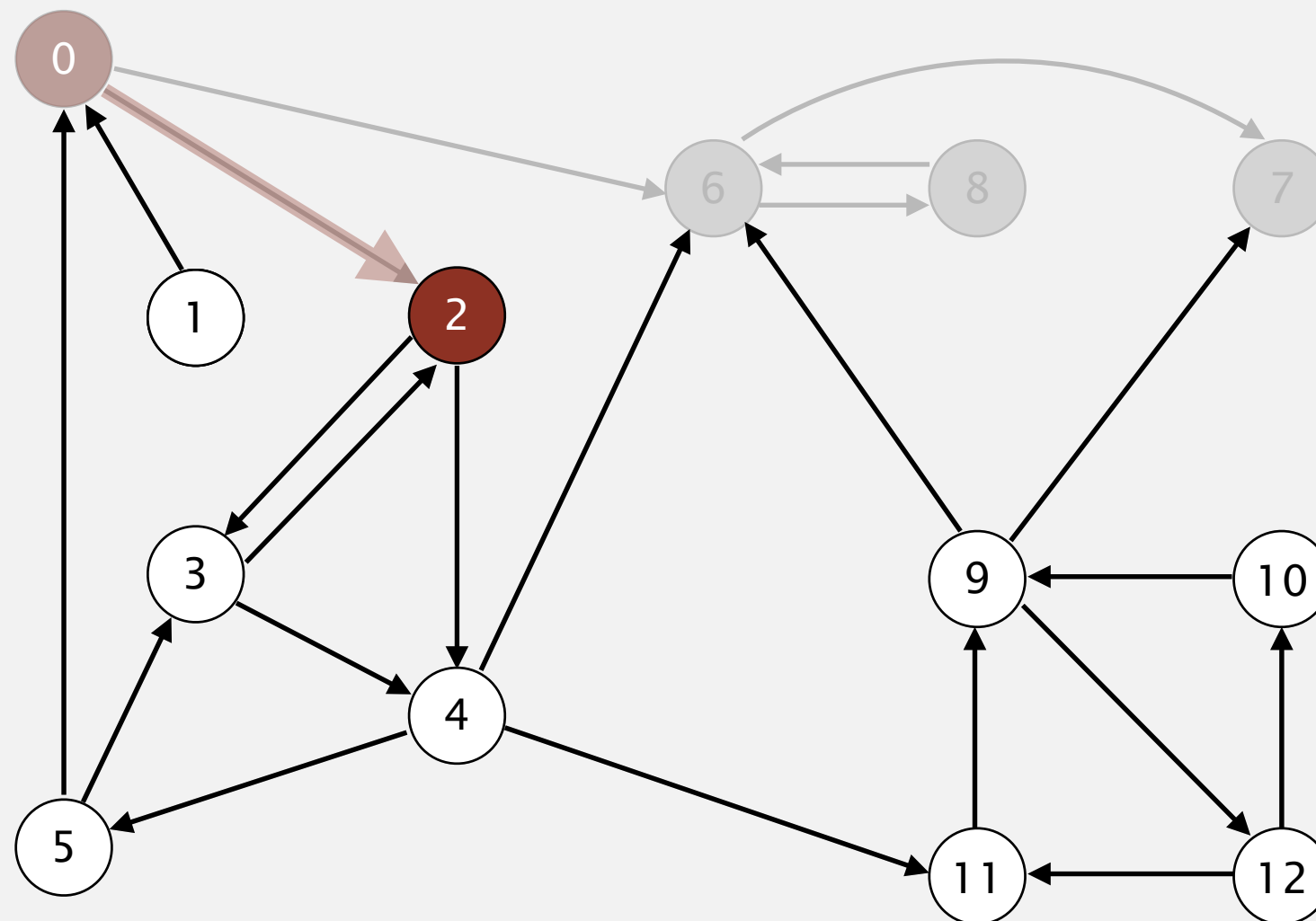


visit 0

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

Phase 1. Compute reverse postorder in G^R .

6 7 8

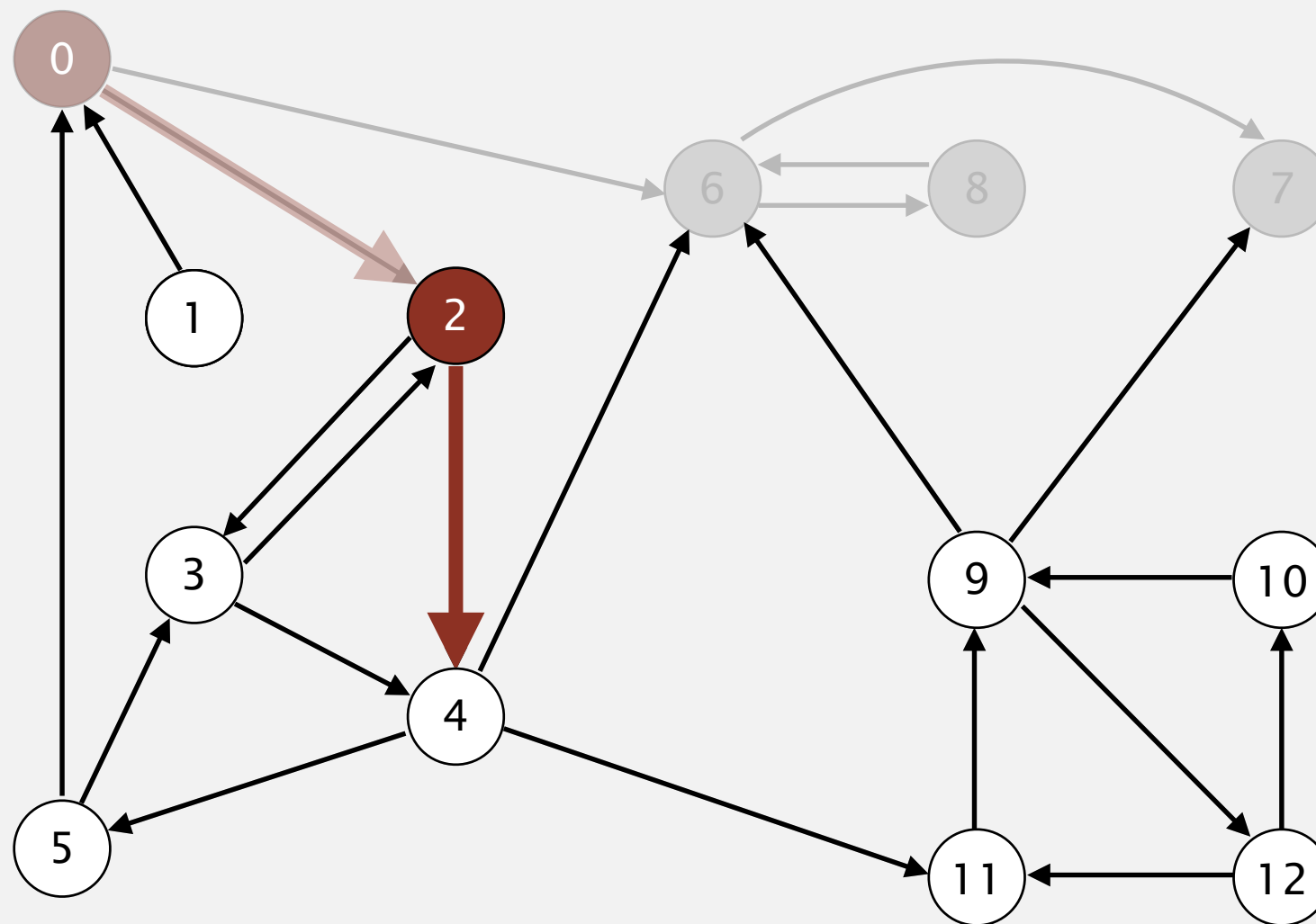


visit 2

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

Phase 1. Compute reverse postorder in G^R .

6 7 8

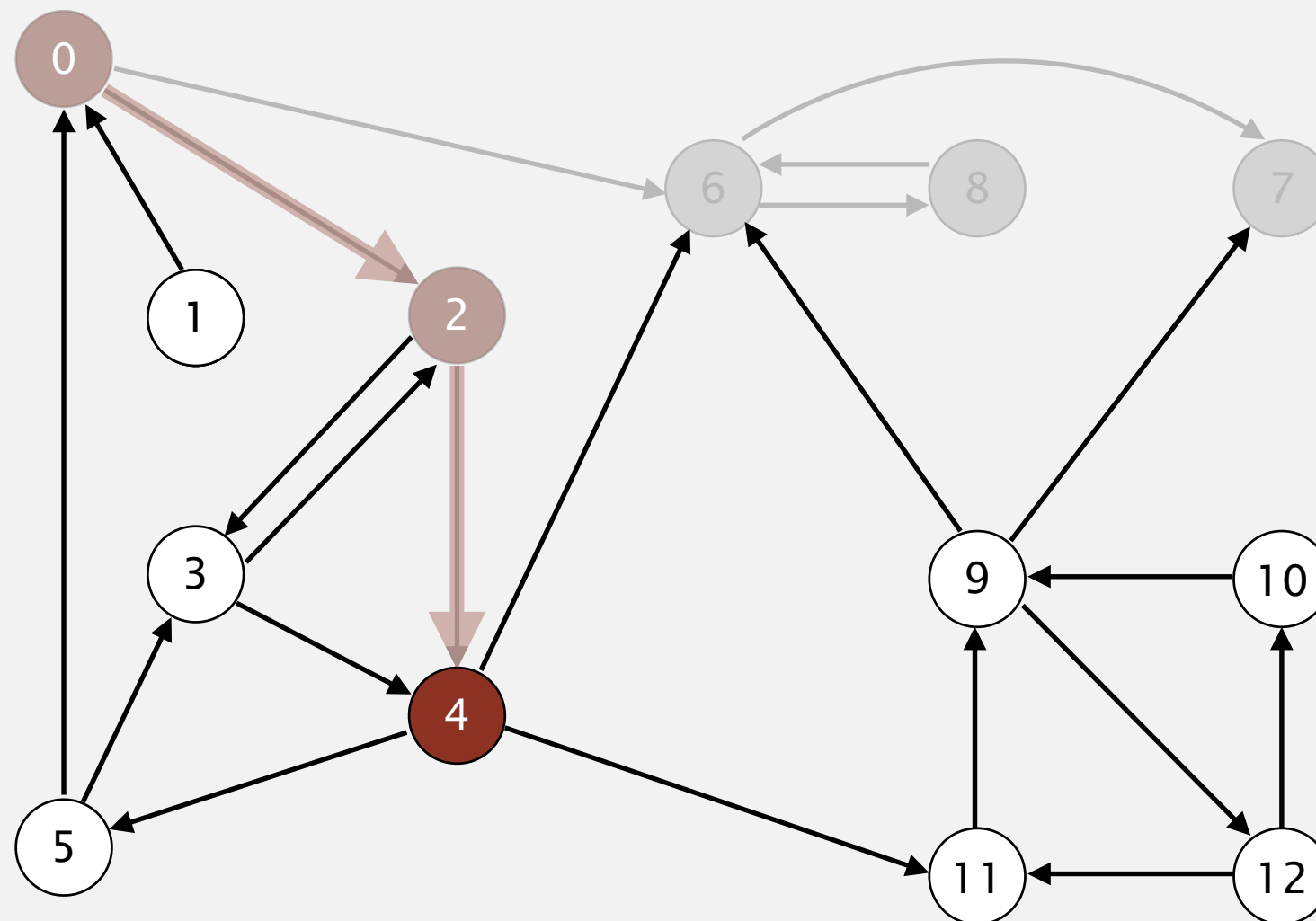


visit 2

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

Phase 1. Compute reverse postorder in G^R .

6 7 8

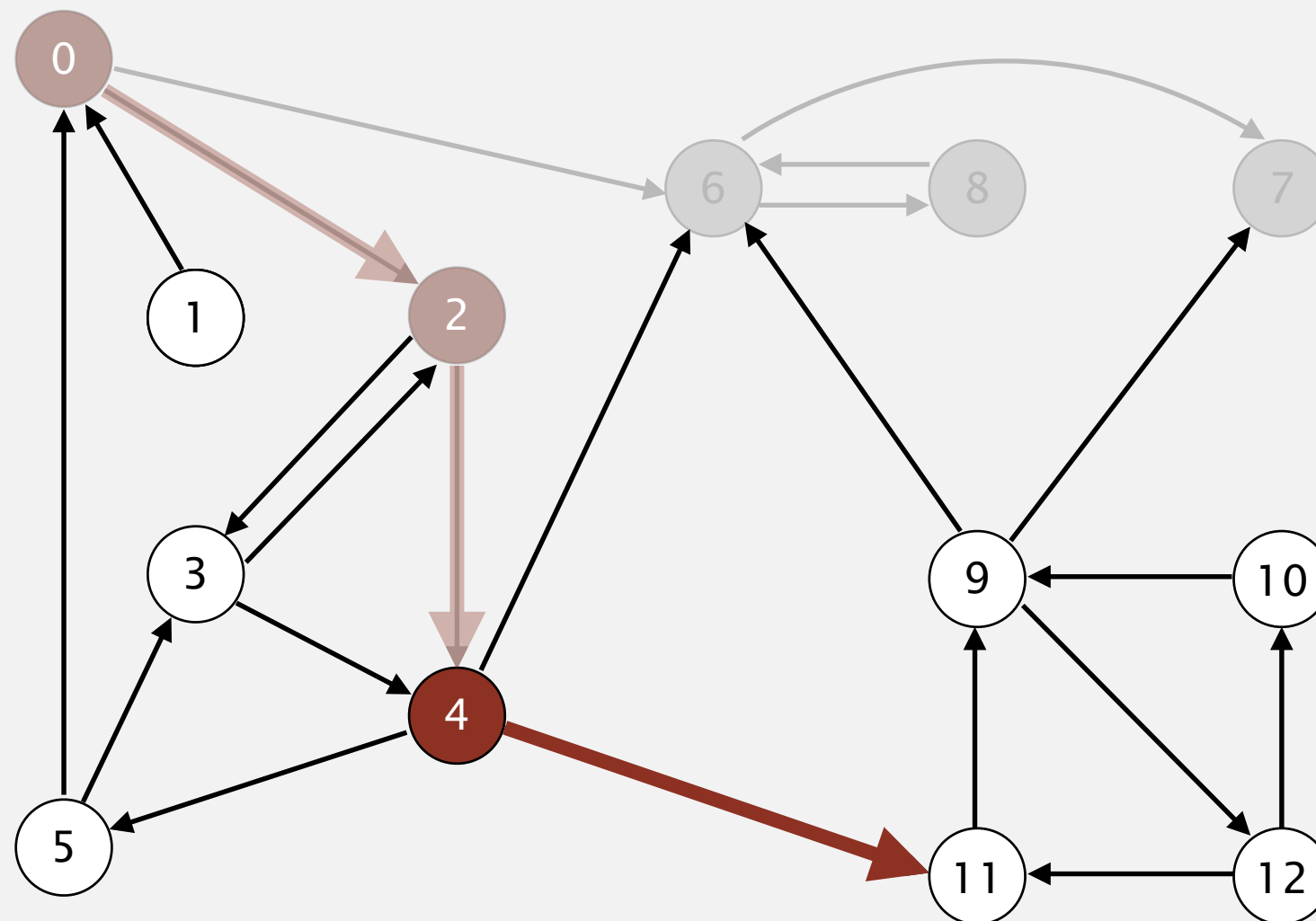


visit 4

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

Phase 1. Compute reverse postorder in G^R .

6 7 8

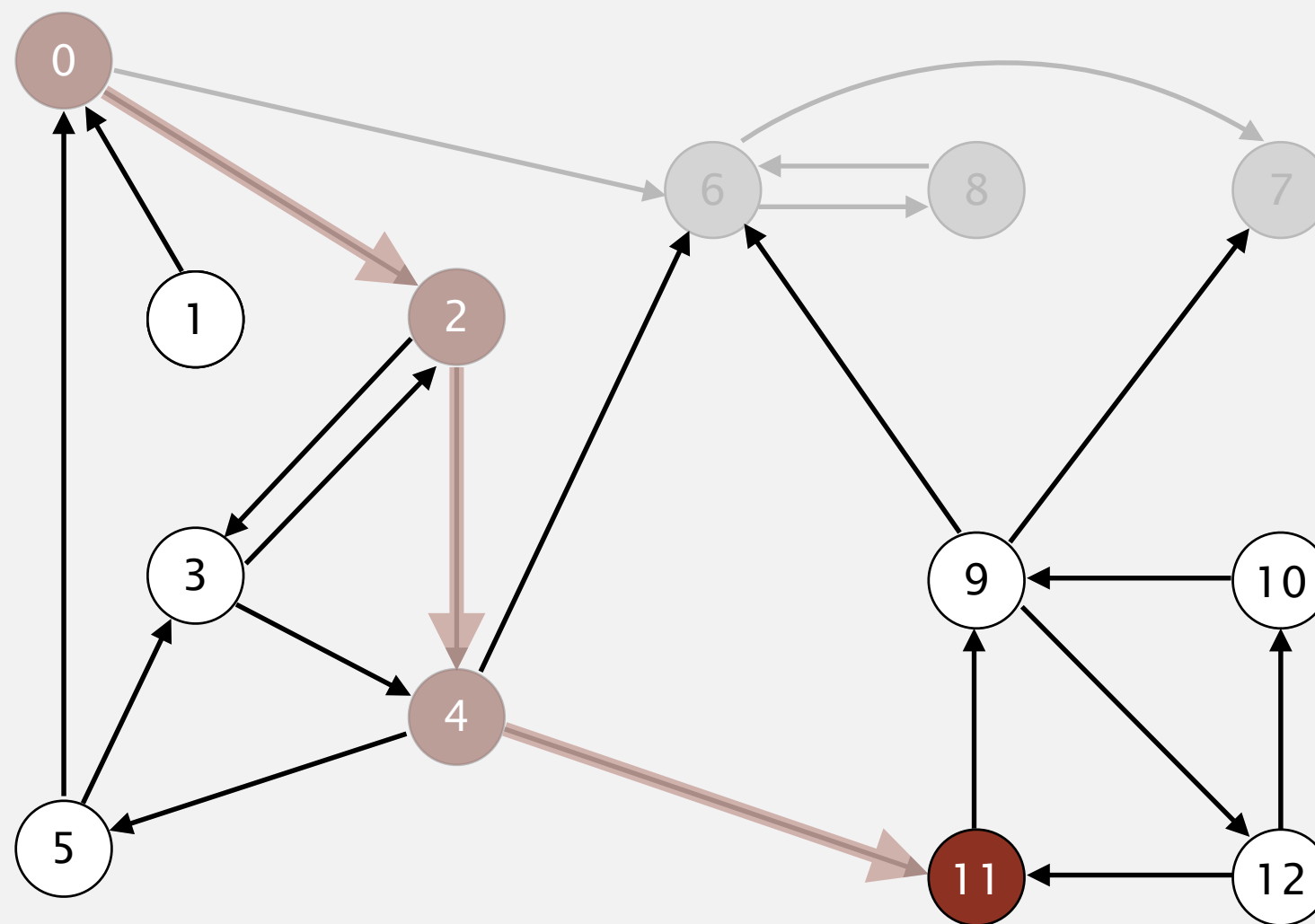


visit 4

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

Phase 1. Compute reverse postorder in G^R .

6 7 8

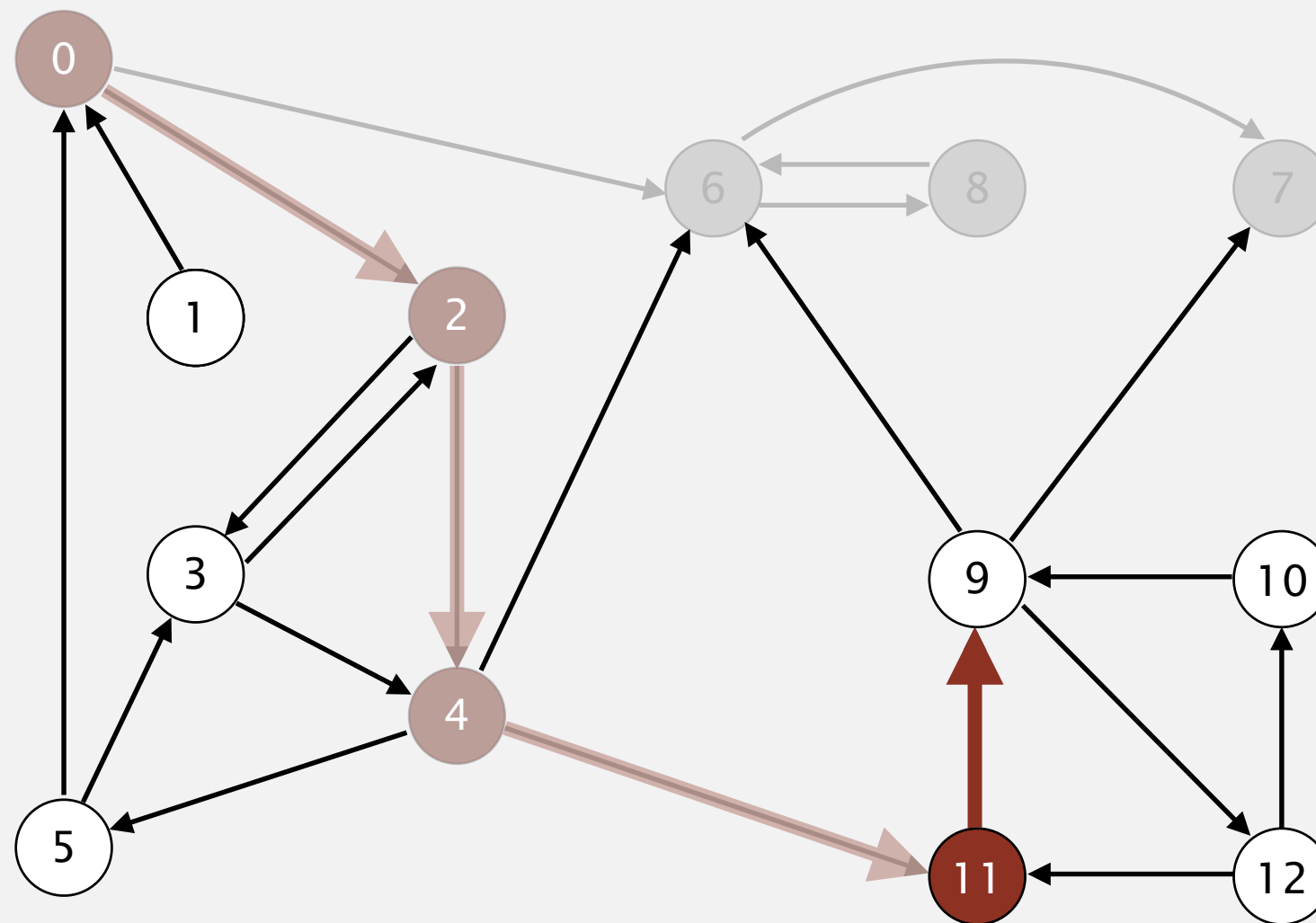


visit 11

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

Phase 1. Compute reverse postorder in G^R .

6 7 8

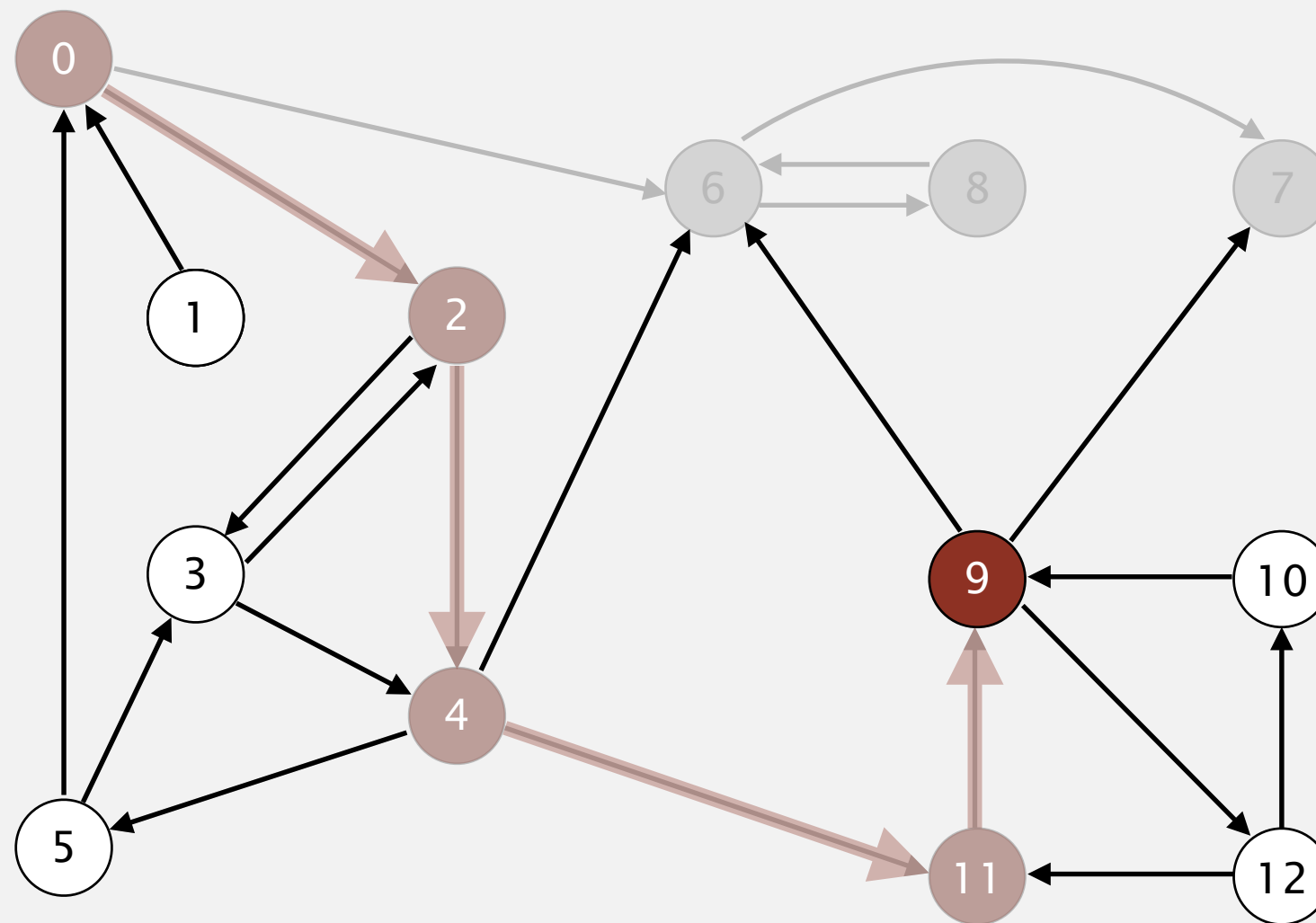


visit 11

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

Phase 1. Compute reverse postorder in G^R .

6 7 8

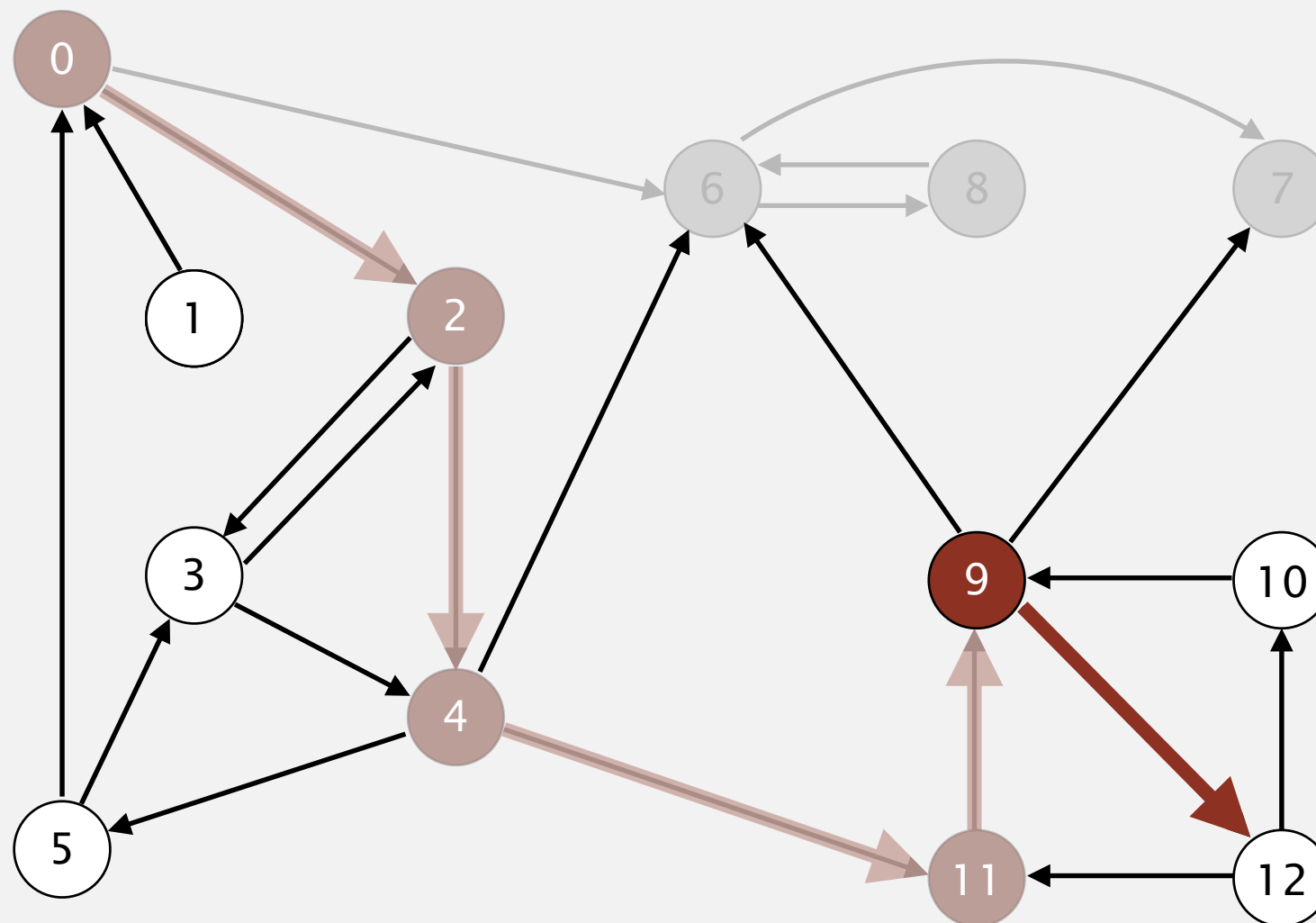


visit 9

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

Phase 1. Compute reverse postorder in G^R .

6 7 8

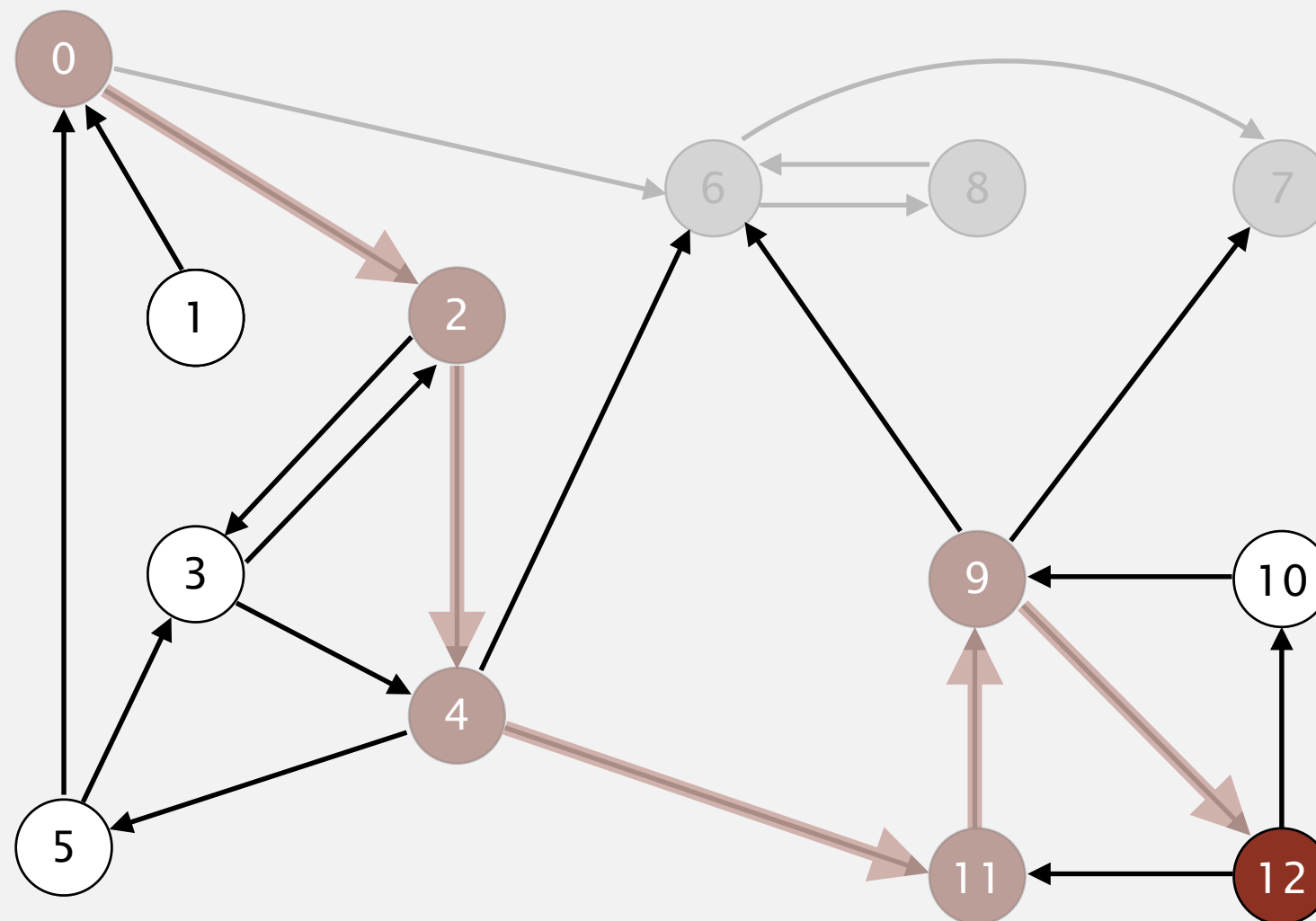


visit 9

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

Phase 1. Compute reverse postorder in G^R .

6 7 8

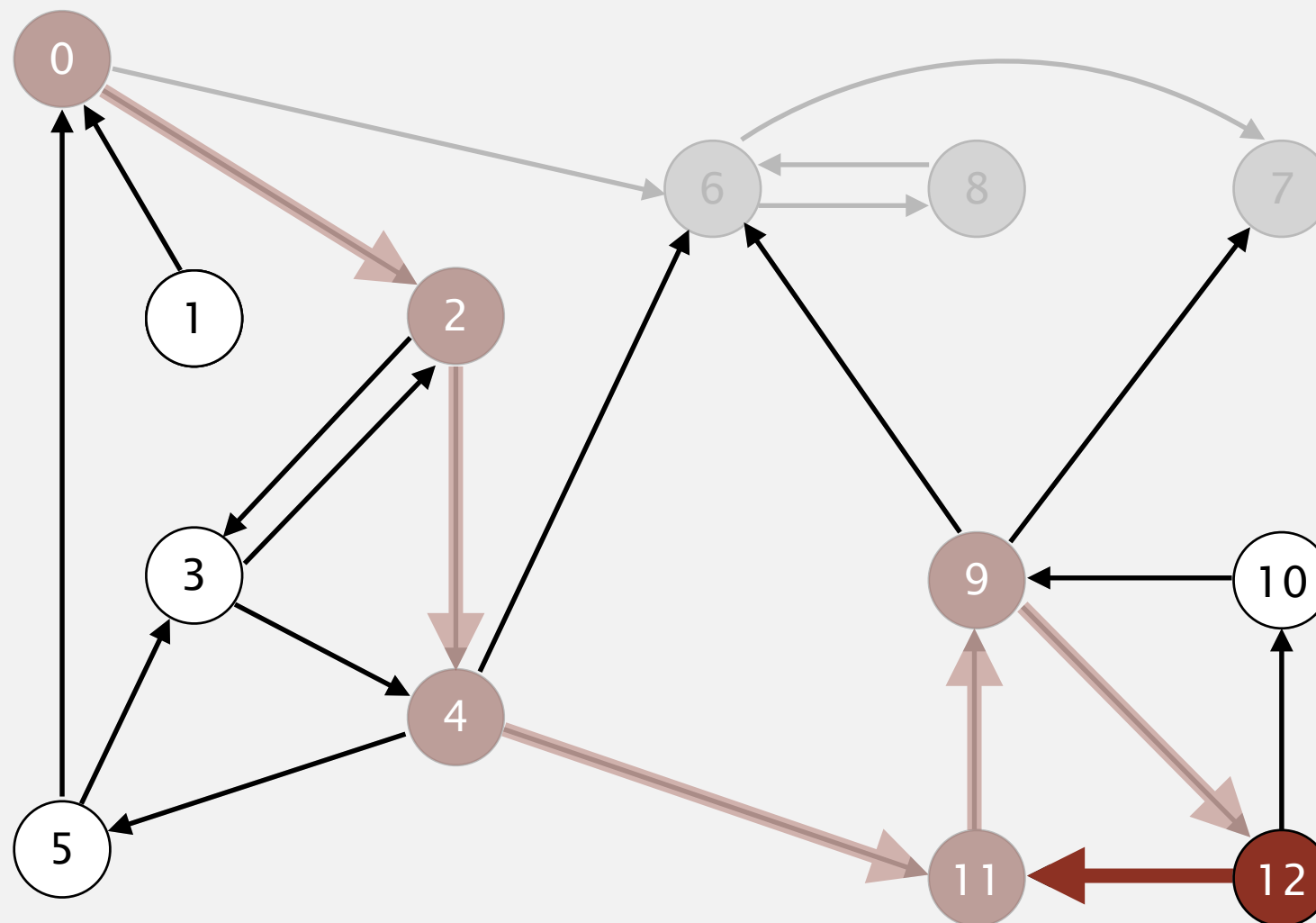


visit 12

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

Phase 1. Compute reverse postorder in G^R .

6 7 8

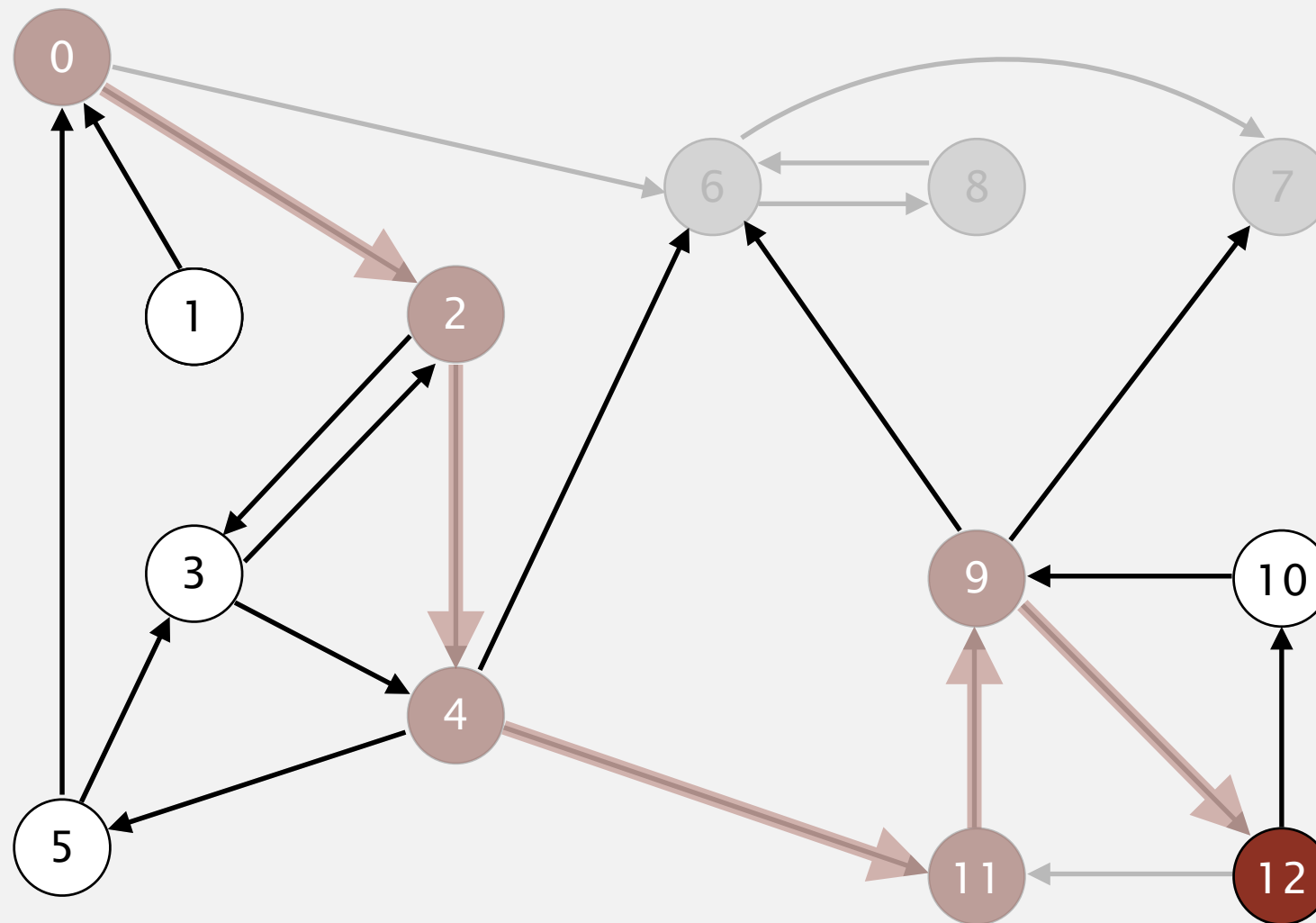


visit 12

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

Phase 1. Compute reverse postorder in G^R .

6 7 8

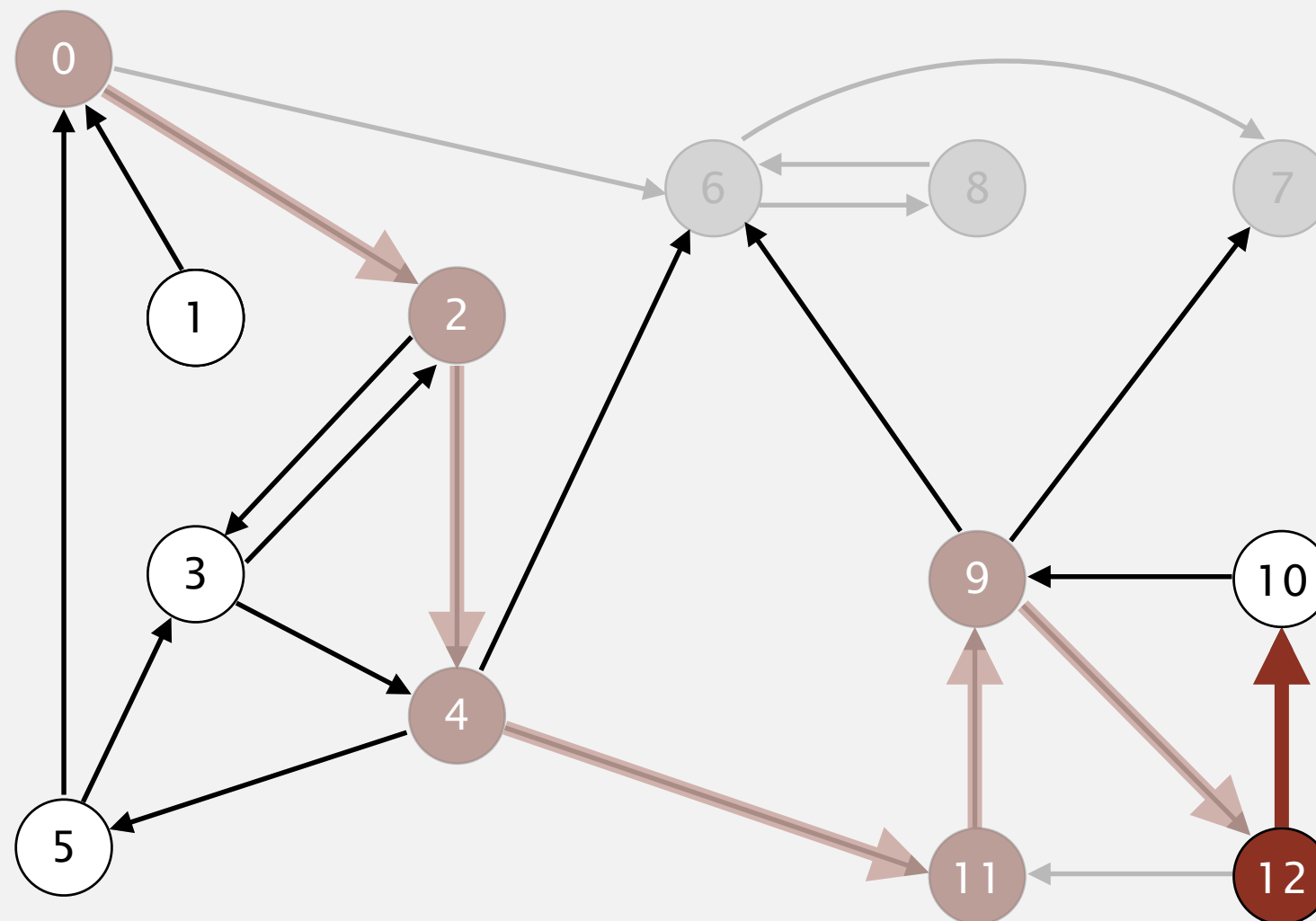


visit 12

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

Phase 1. Compute reverse postorder in G^R .

6 7 8

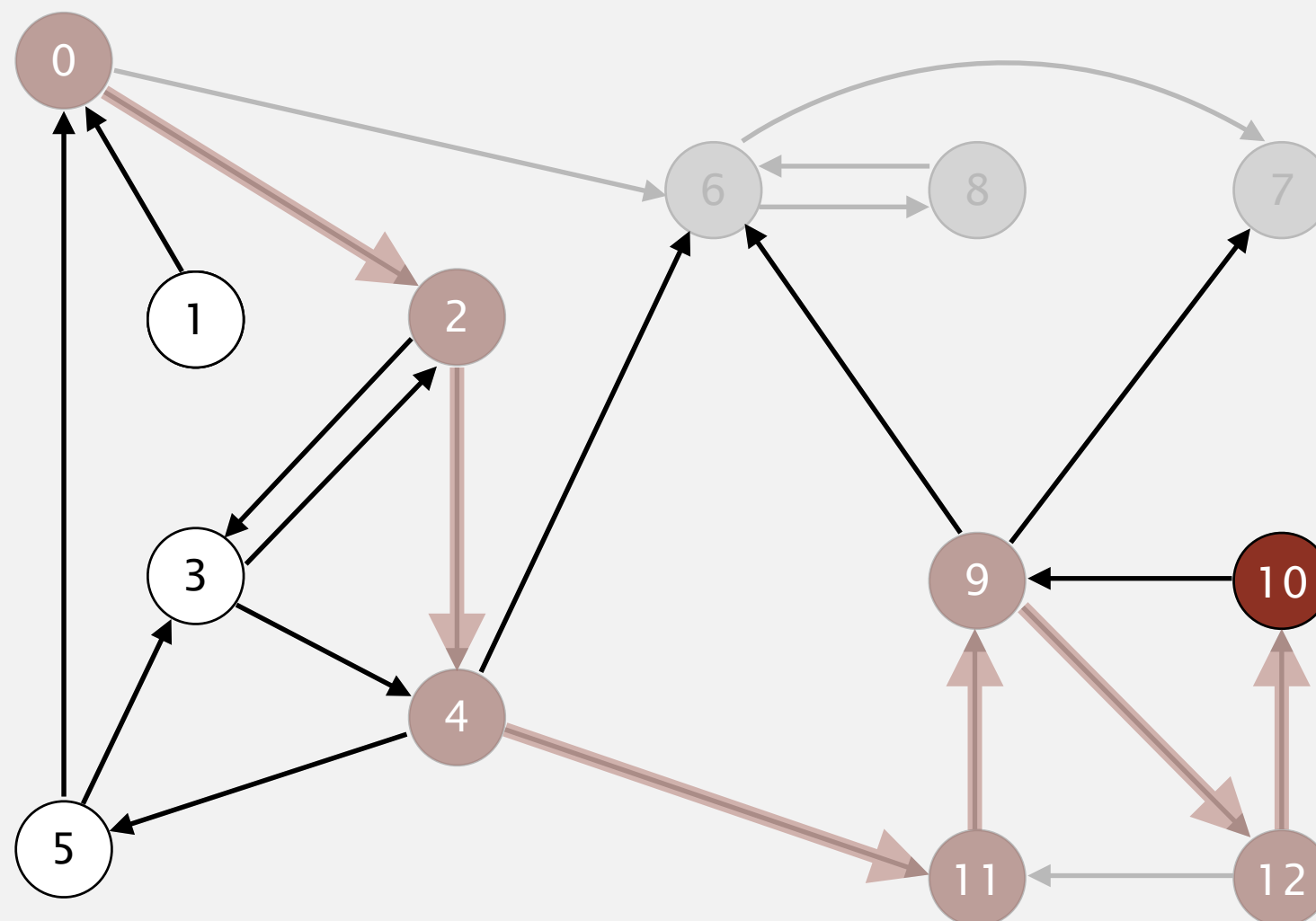


visit 12

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

Phase 1. Compute reverse postorder in G^R .

6 7 8

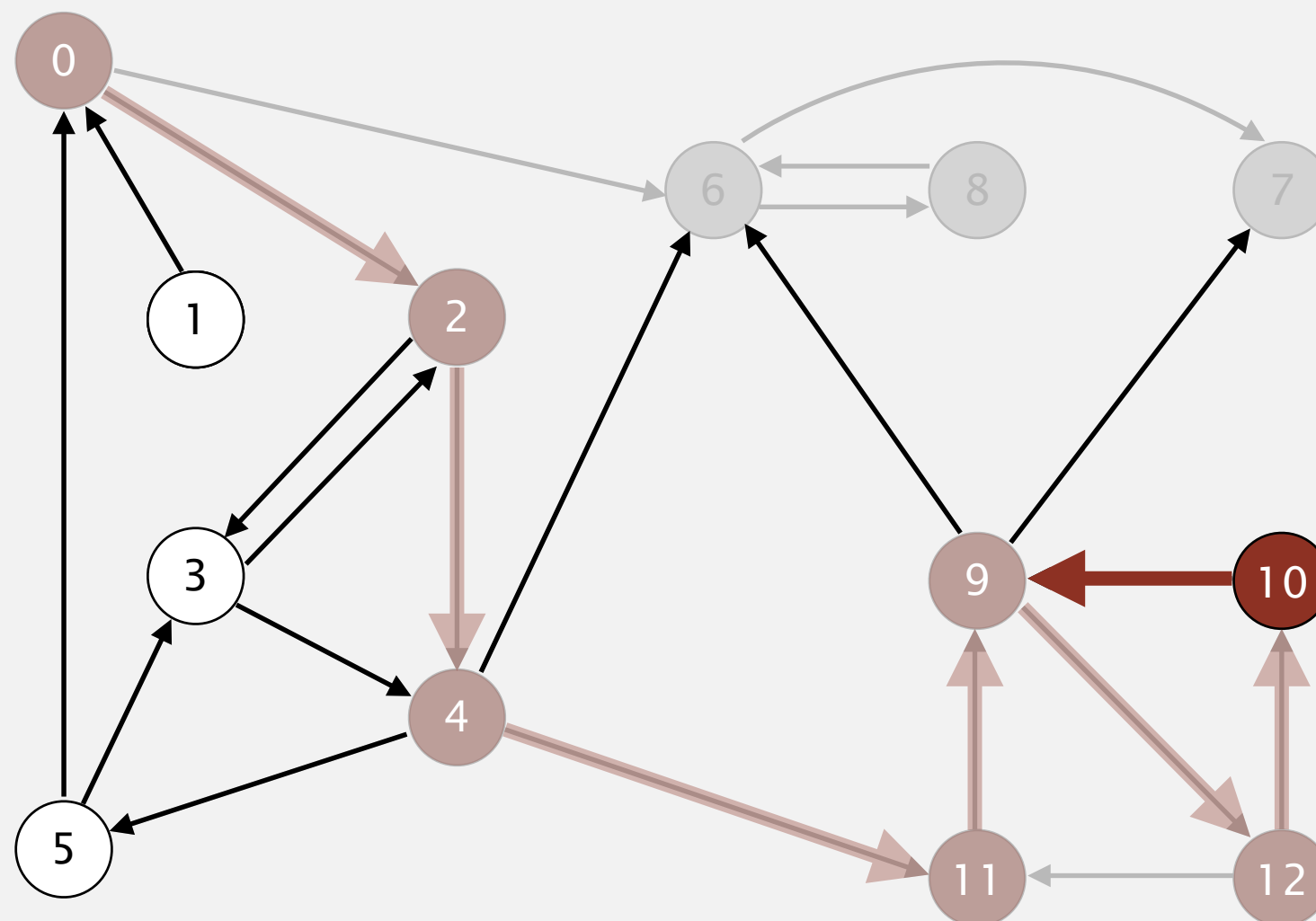


visit 10

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

Phase 1. Compute reverse postorder in G^R .

6 7 8

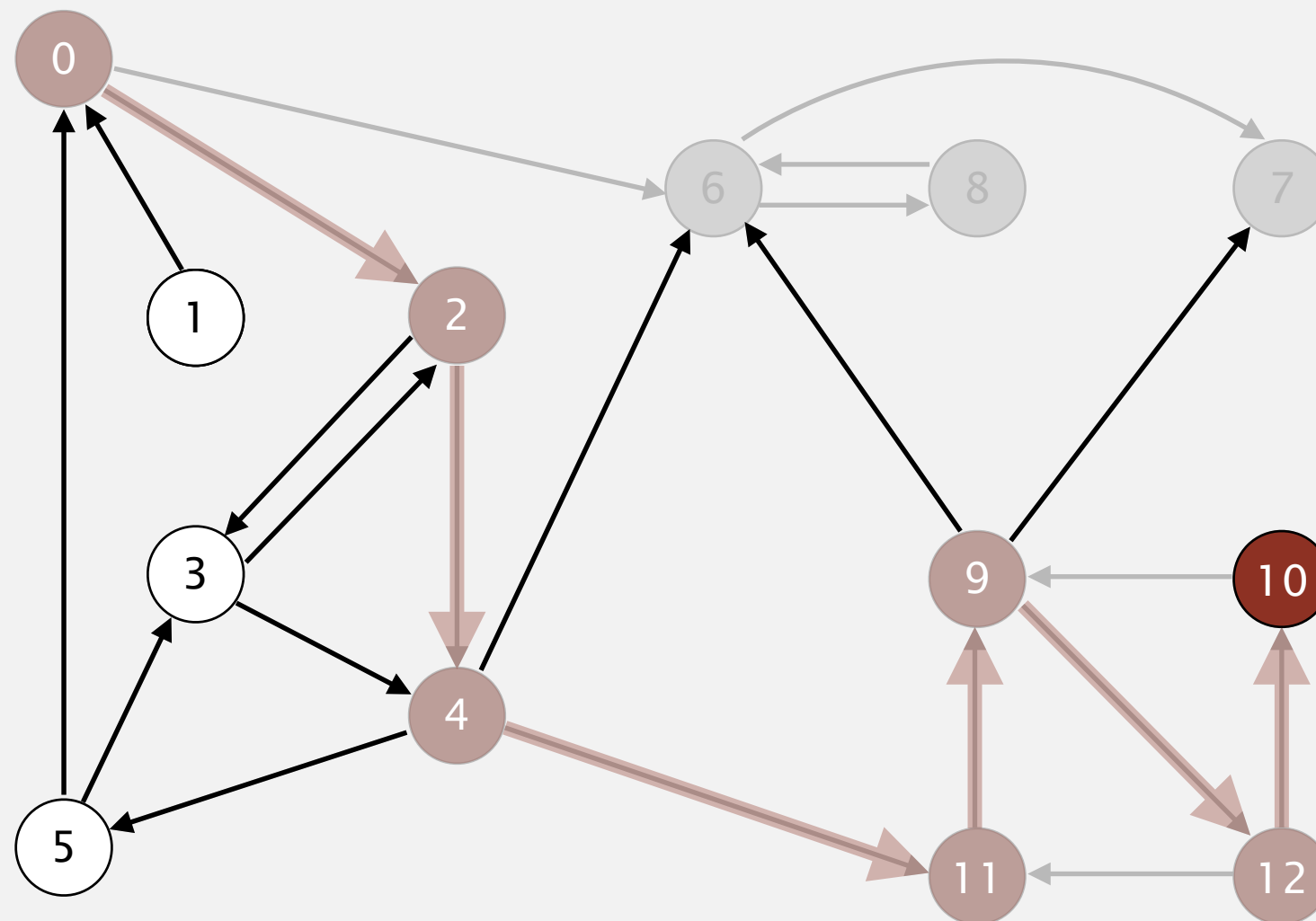


visit 10

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

Phase 1. Compute reverse postorder in G^R .

10 6 7 8

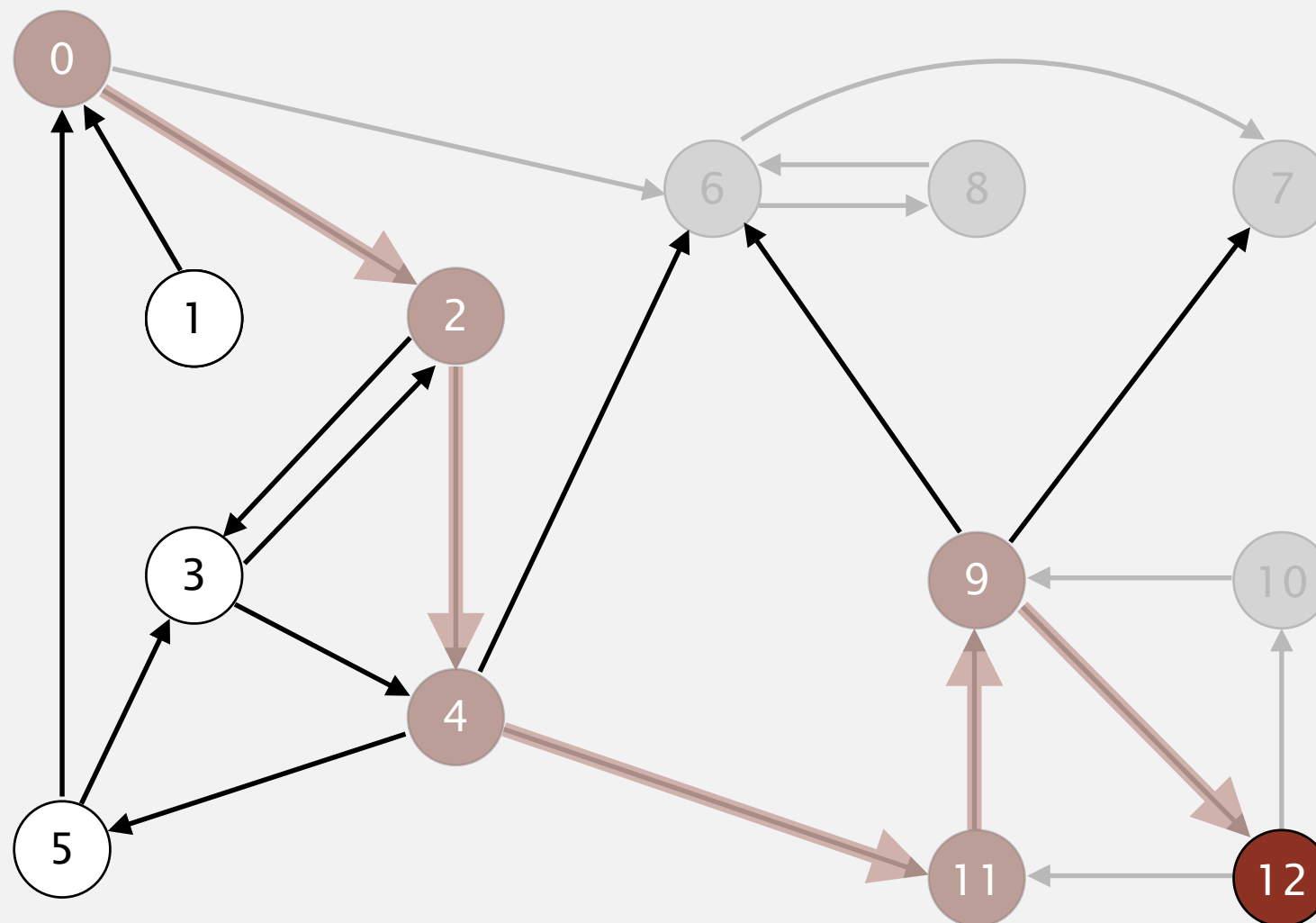


10 done

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

Phase 1. Compute reverse postorder in G^R .

10 6 7 8

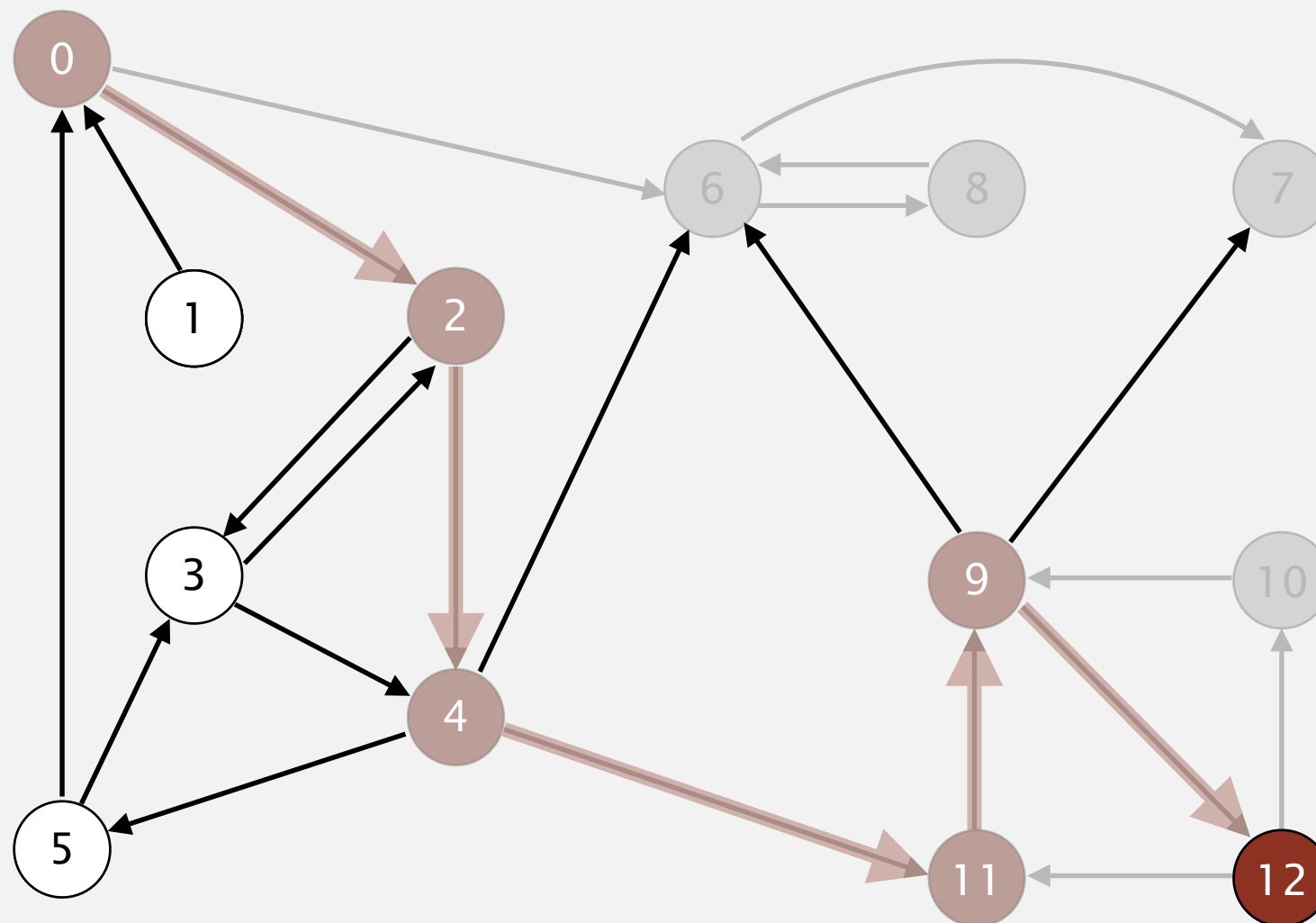


10 done

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

Phase 1. Compute reverse postorder in G^R .

12 10 6 7 8

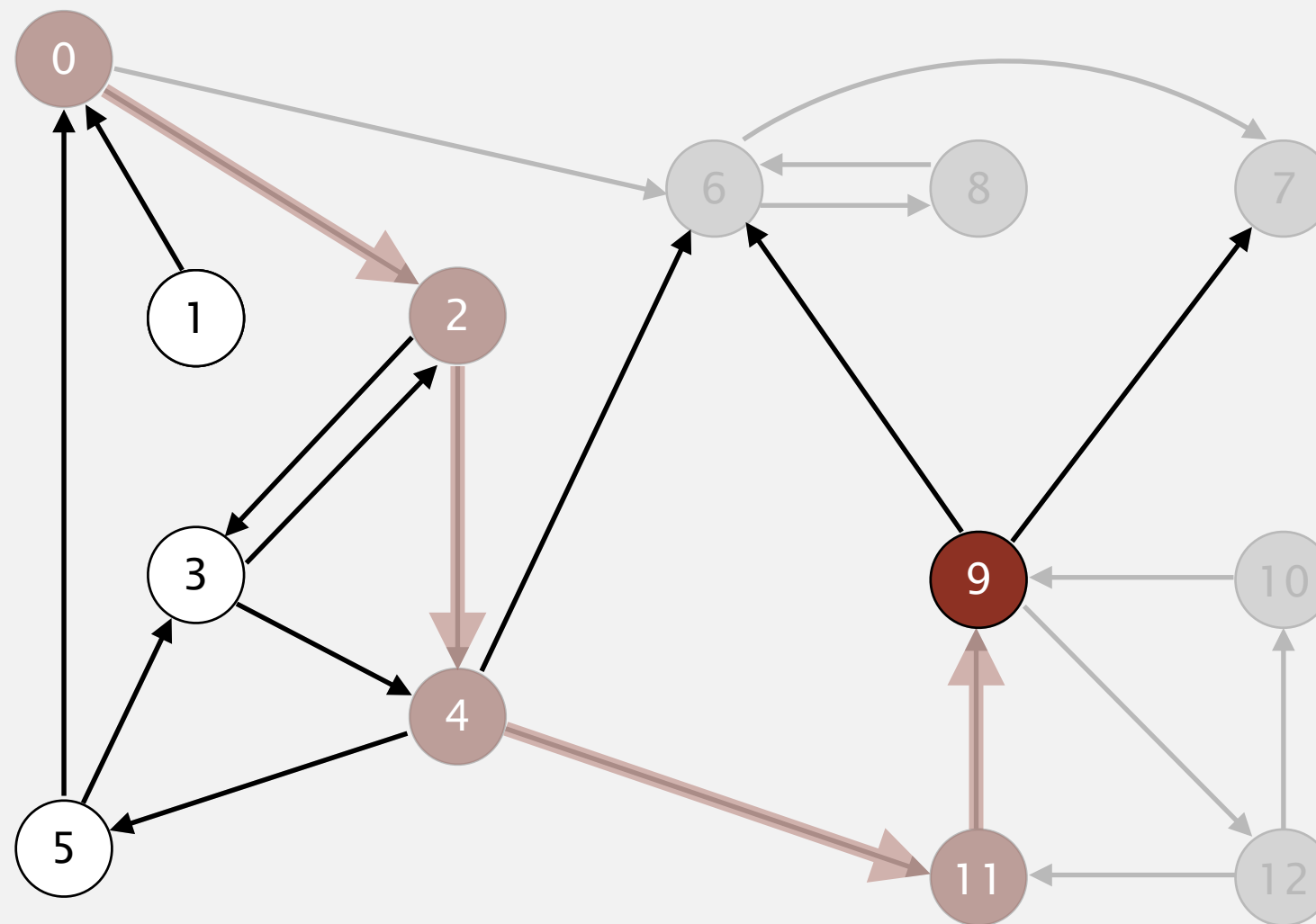


12 done

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

Phase 1. Compute reverse postorder in G^R .

12 10 6 7 8

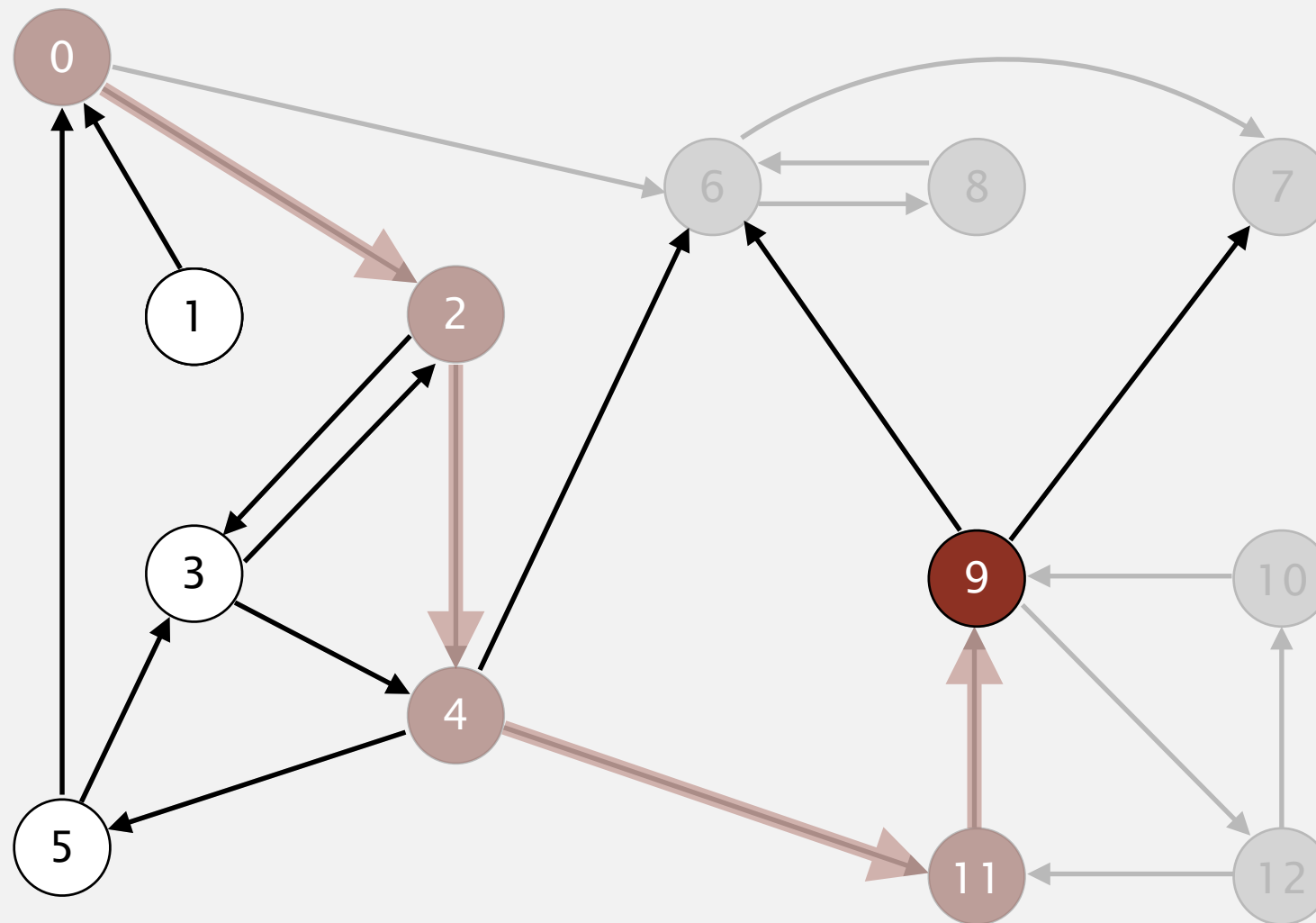


12 done

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

Phase 1. Compute reverse postorder in G^R .

12 10 6 7 8

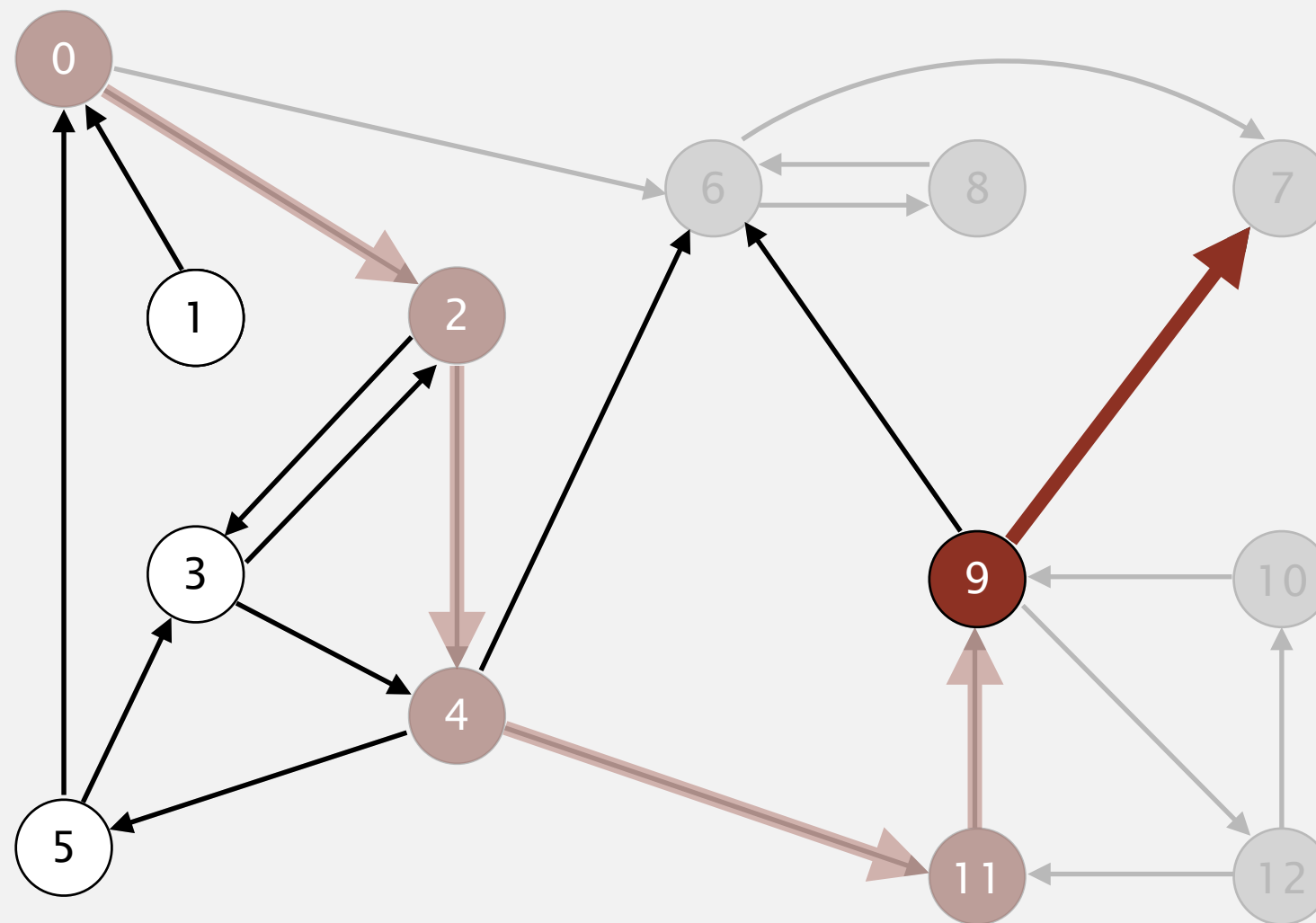


visit 9

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

Phase 1. Compute reverse postorder in G^R .

12 10 6 7 8

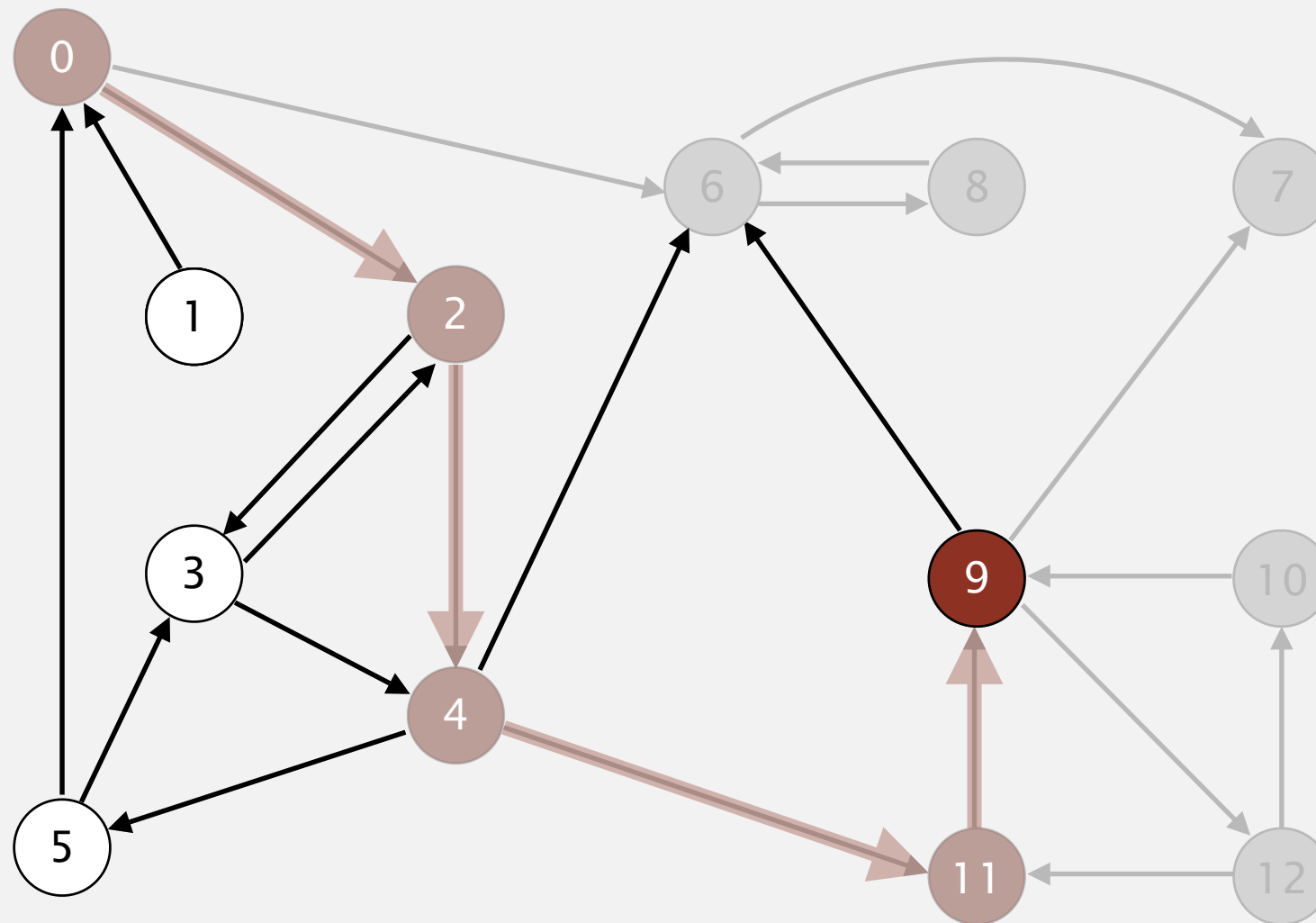


visit 9

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

Phase 1. Compute reverse postorder in G^R .

12 10 6 7 8

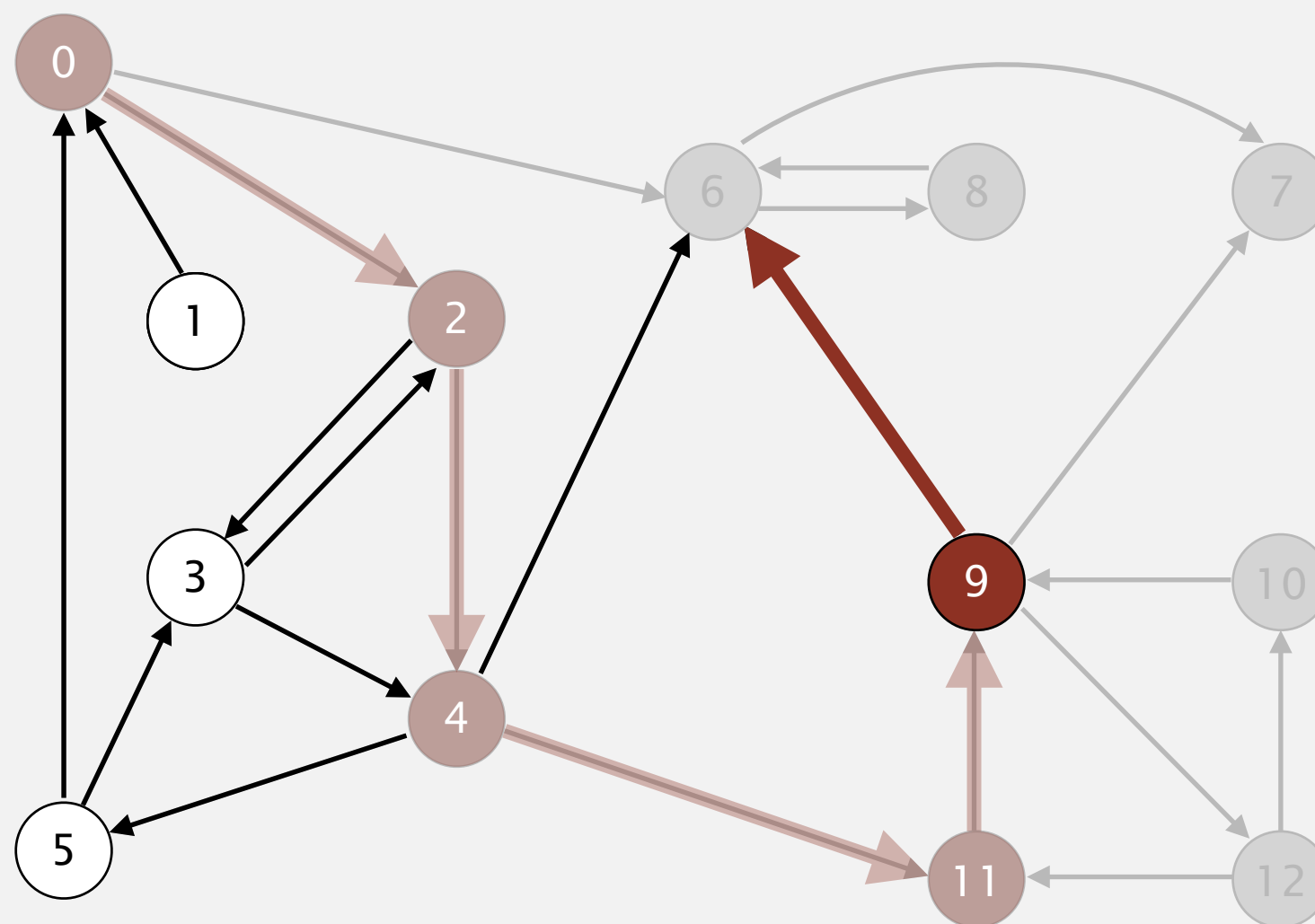


visit 9

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

Phase 1. Compute reverse postorder in G^R .

12 10 6 7 8

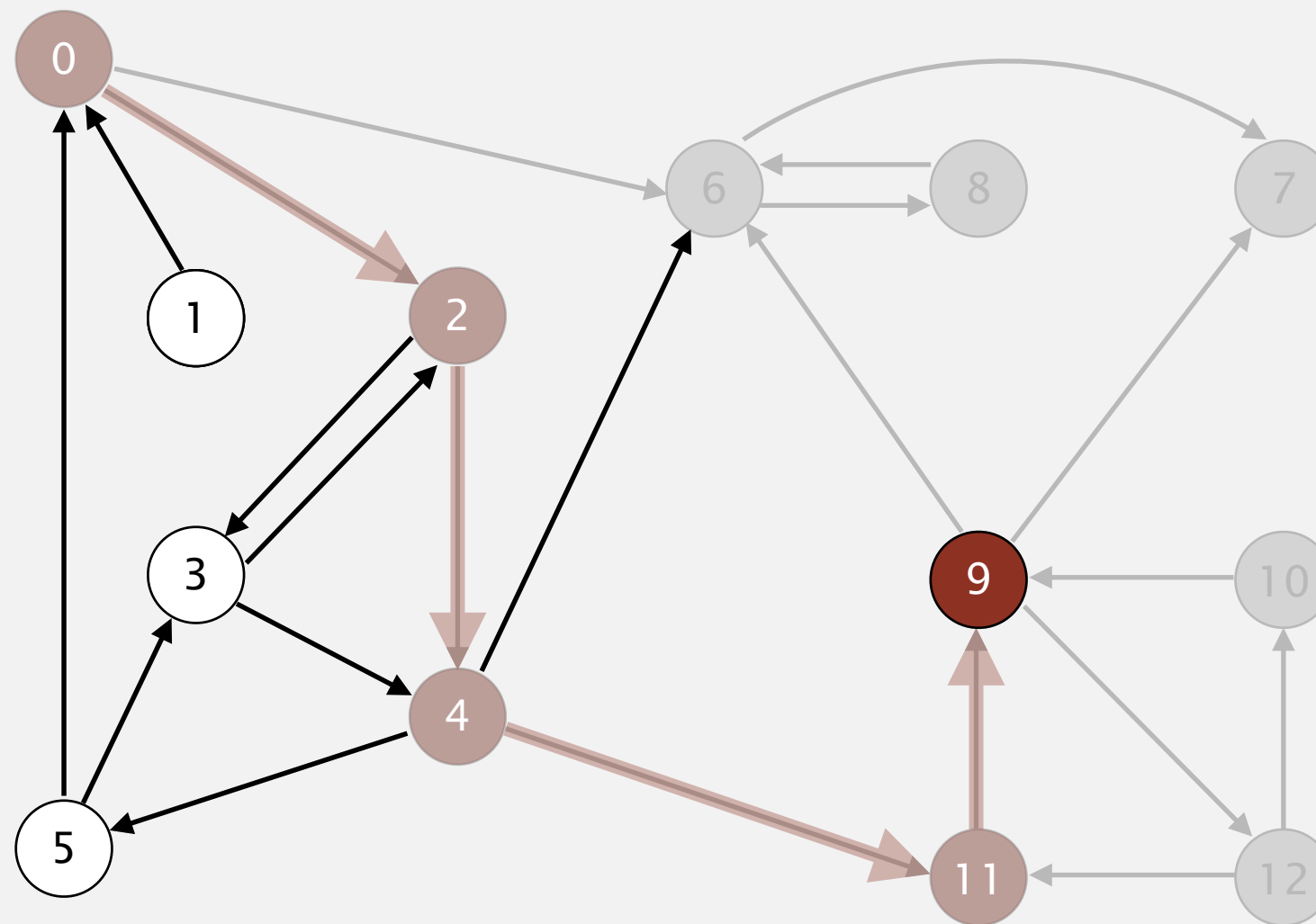


visit 9

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

Phase 1. Compute reverse postorder in G^R .

9 12 10 6 7 8

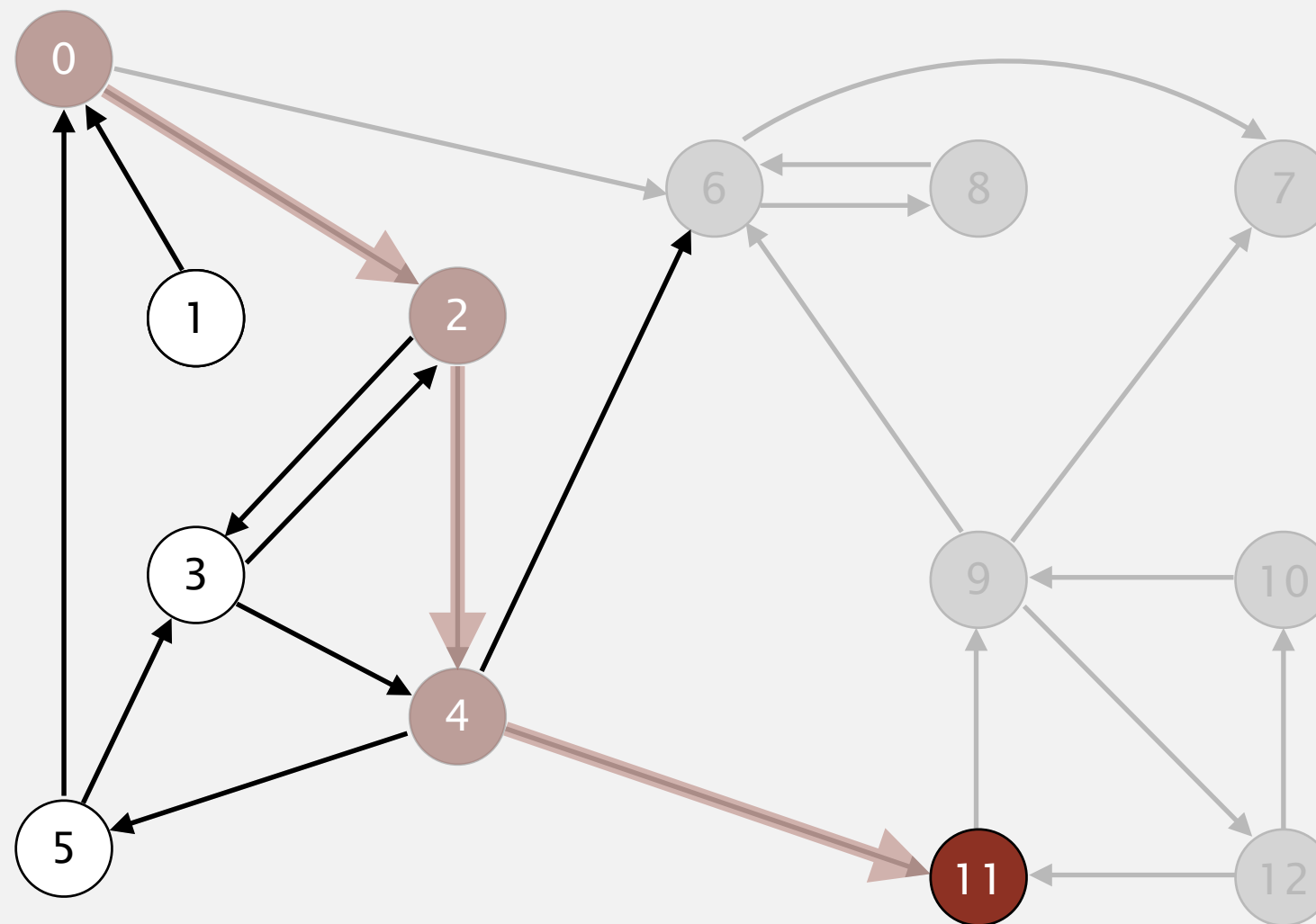


9 done

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

Phase 1. Compute reverse postorder in G^R .

9 12 10 6 7 8

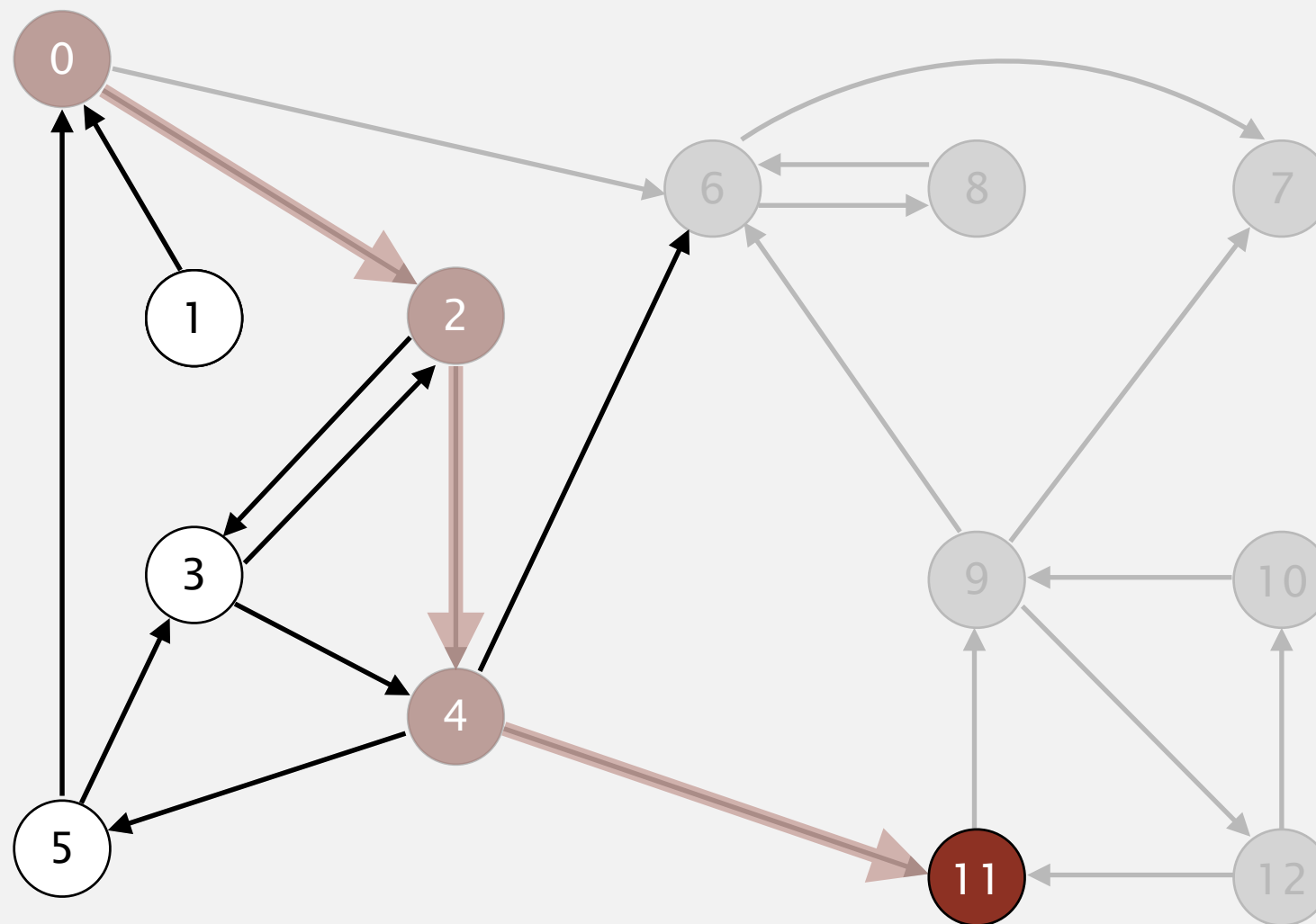


9 done

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

Phase 1. Compute reverse postorder in G^R .

11 9 12 10 6 7 8

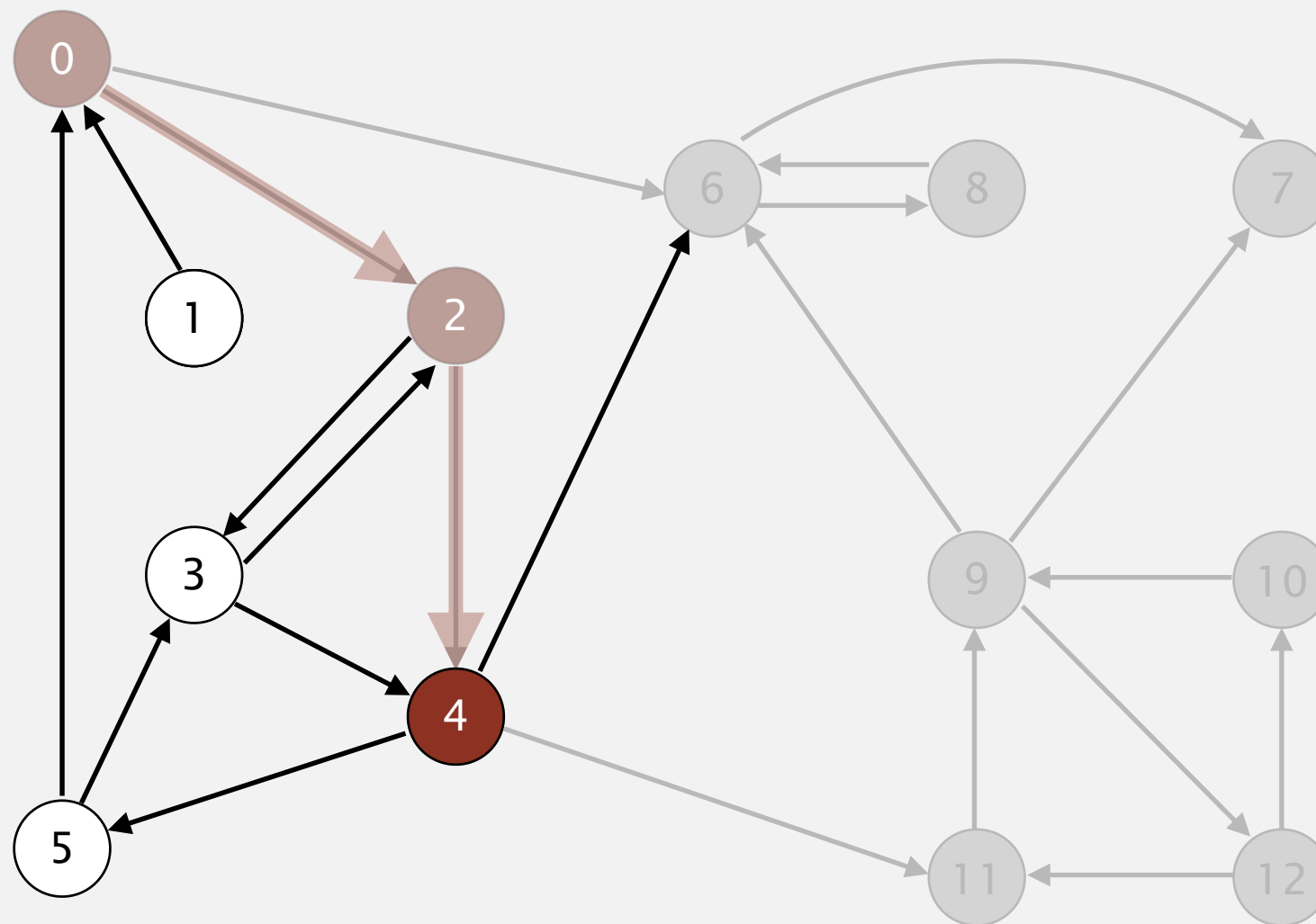


11 done

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

Phase 1. Compute reverse postorder in G^R .

11 9 12 10 6 7 8

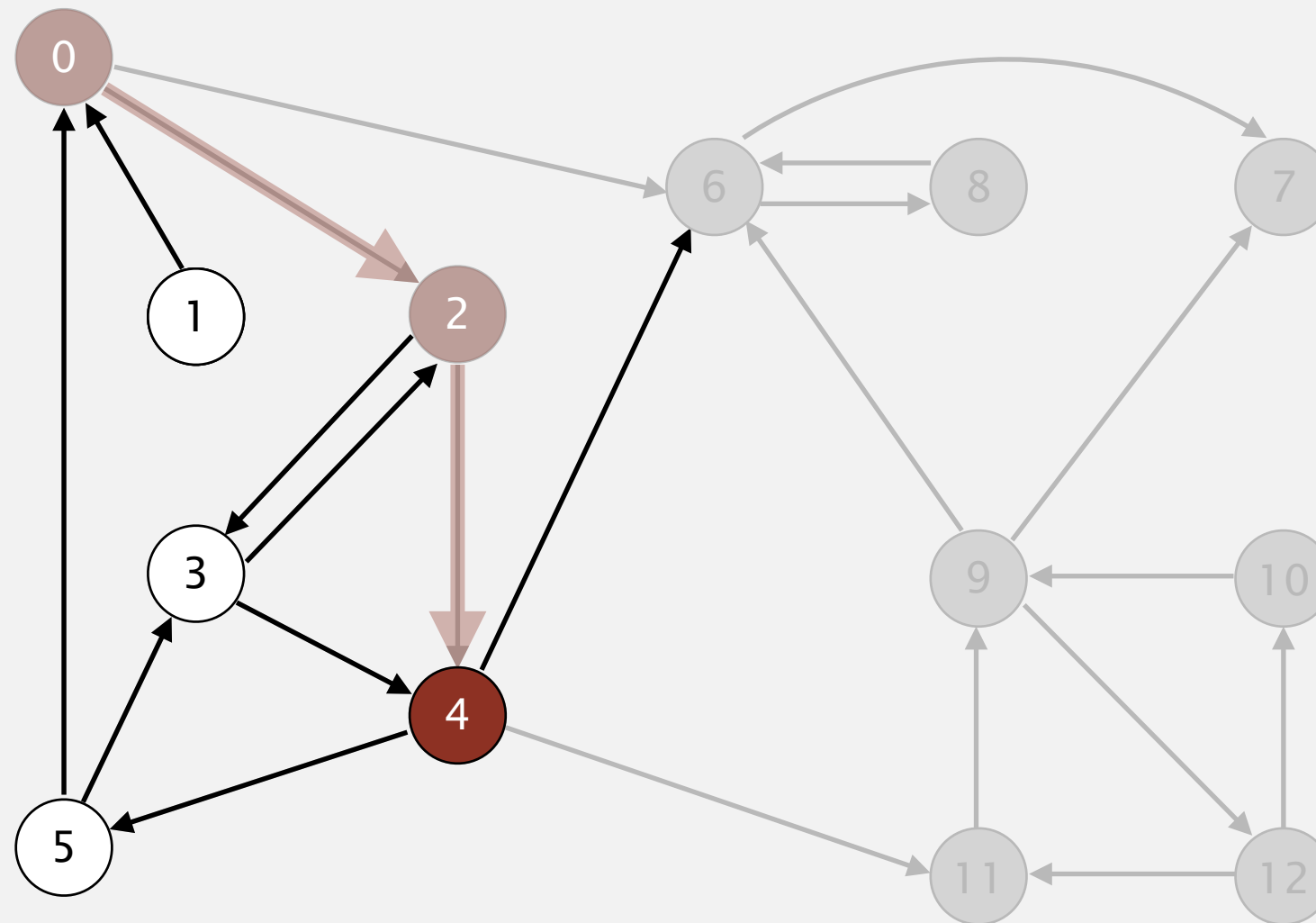


11 done

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

Phase 1. Compute reverse postorder in G^R .

11 9 12 10 6 7 8

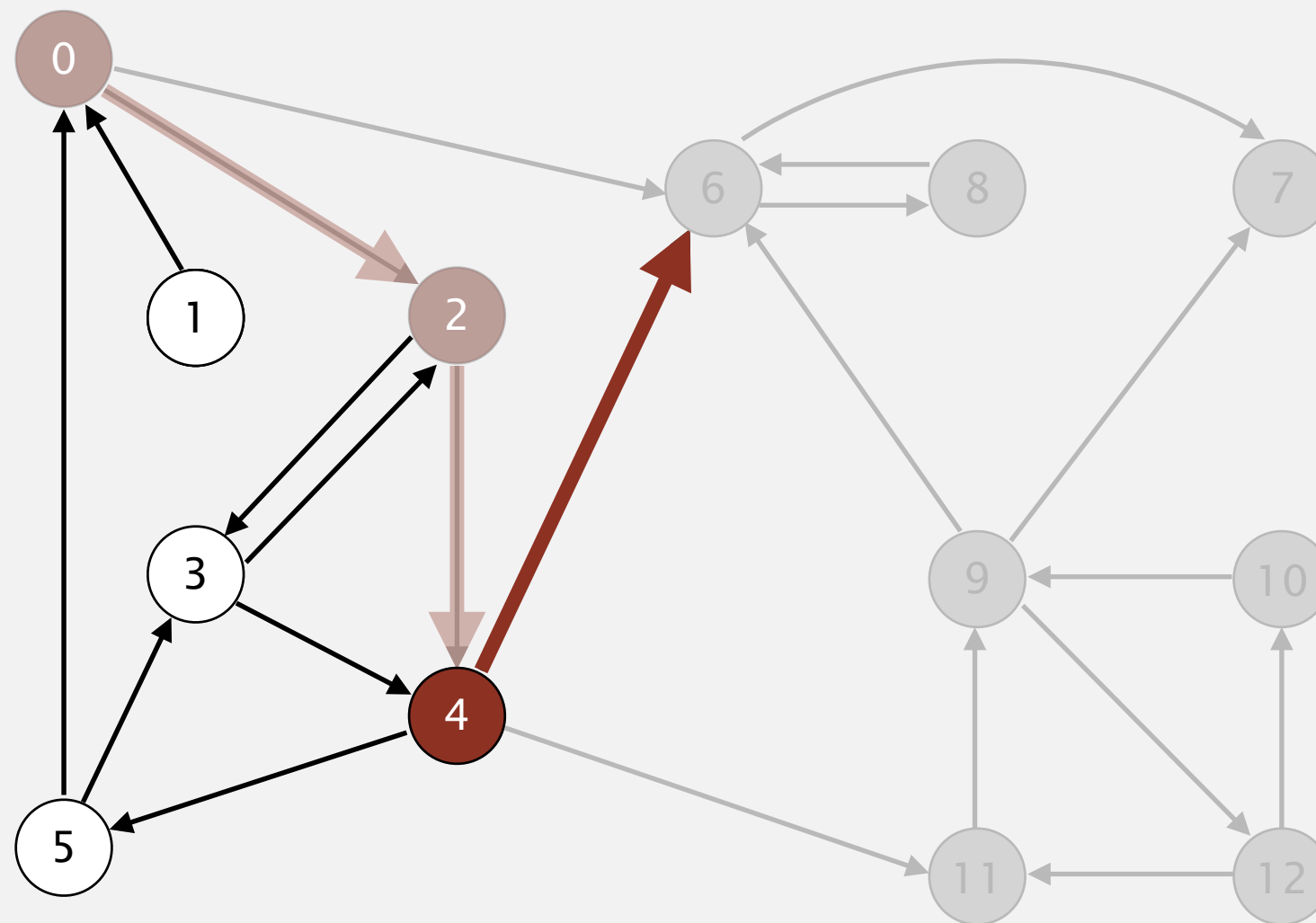


visit 4

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

Phase 1. Compute reverse postorder in G^R .

11 9 12 10 6 7 8

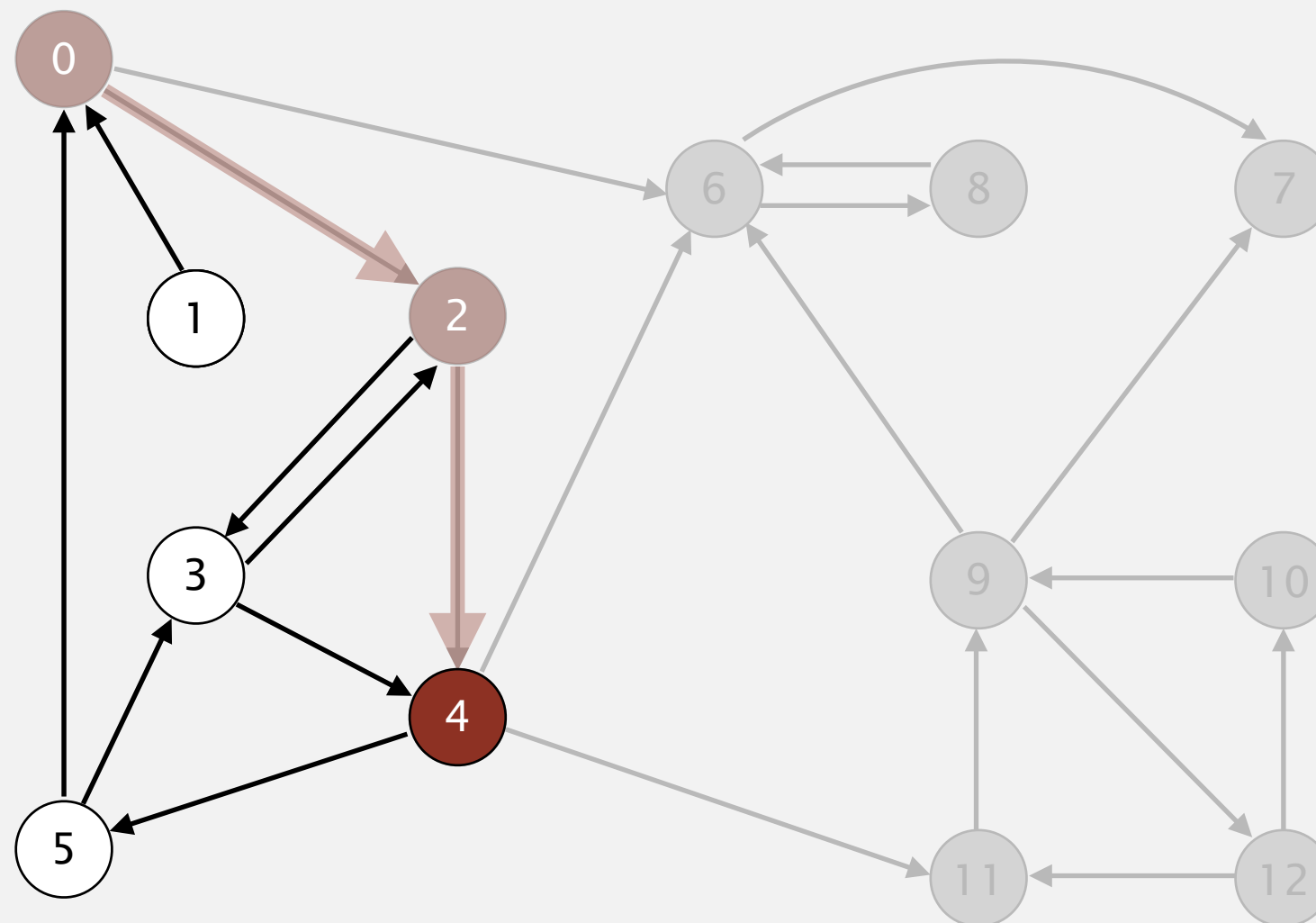


visit 4

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

Phase 1. Compute reverse postorder in G^R .

11 9 12 10 6 7 8

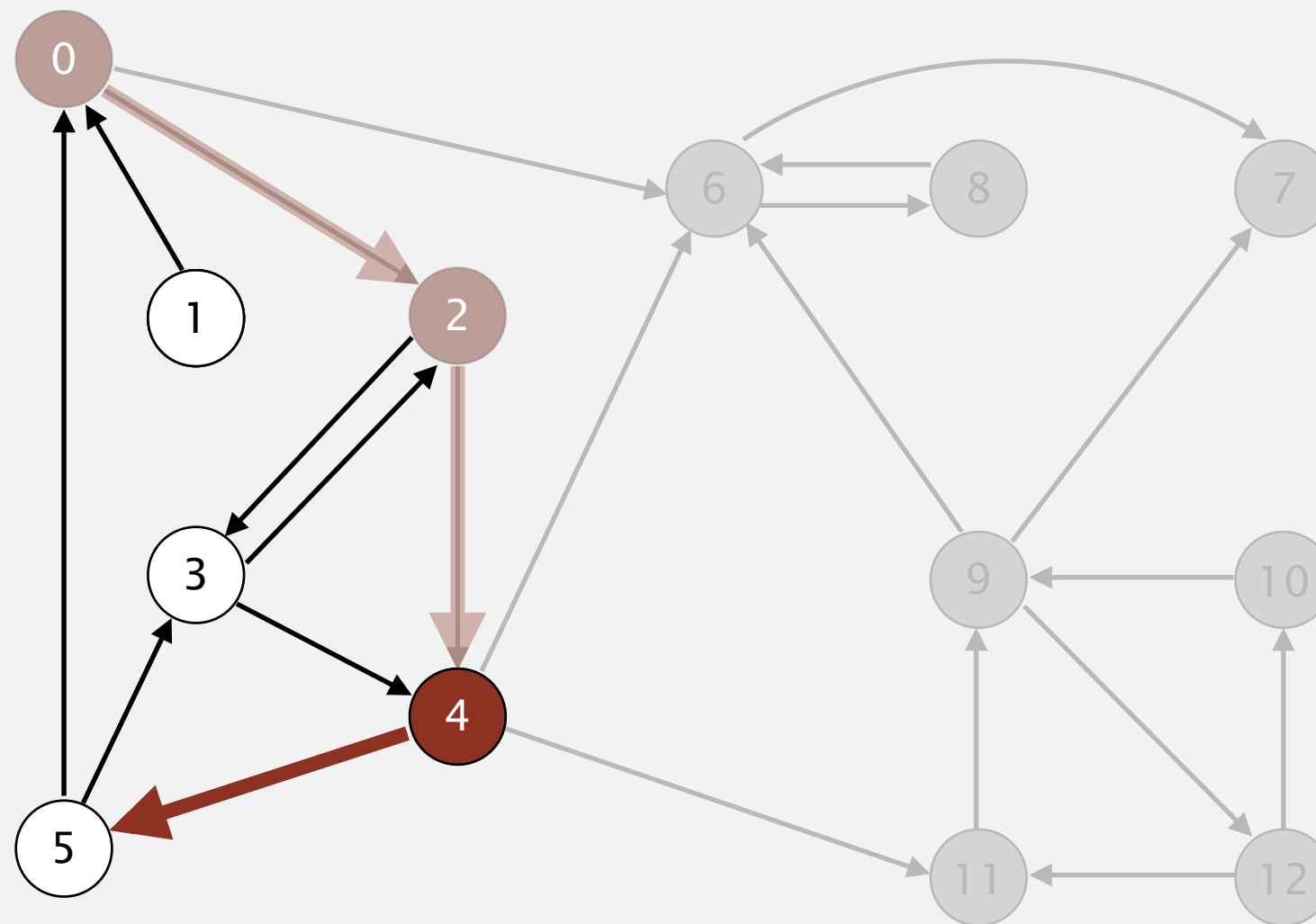


visit 4

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

Phase 1. Compute reverse postorder in G^R .

11 9 12 10 6 7 8

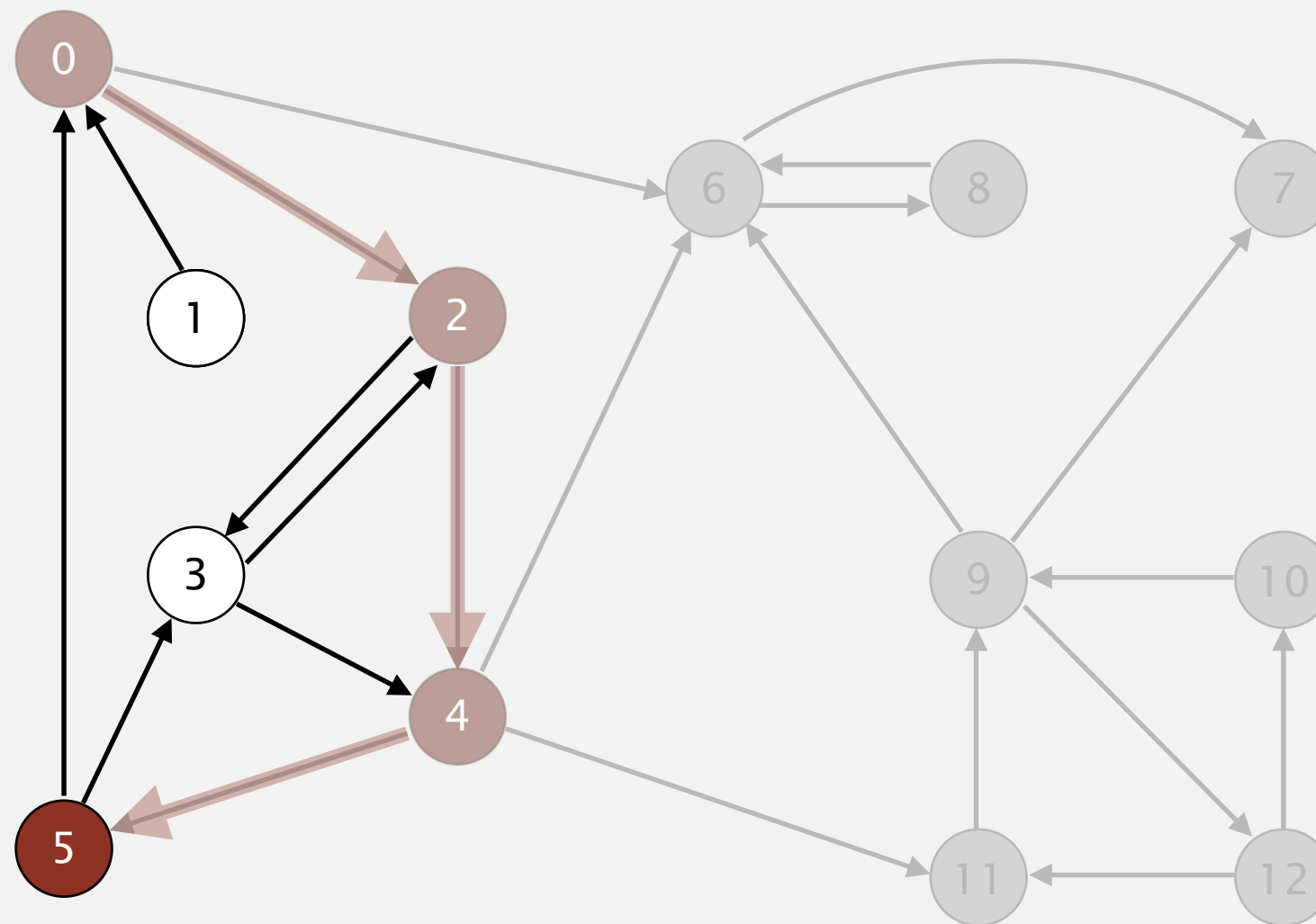


visit 4

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

Phase 1. Compute reverse postorder in G^R .

11 9 12 10 6 7 8

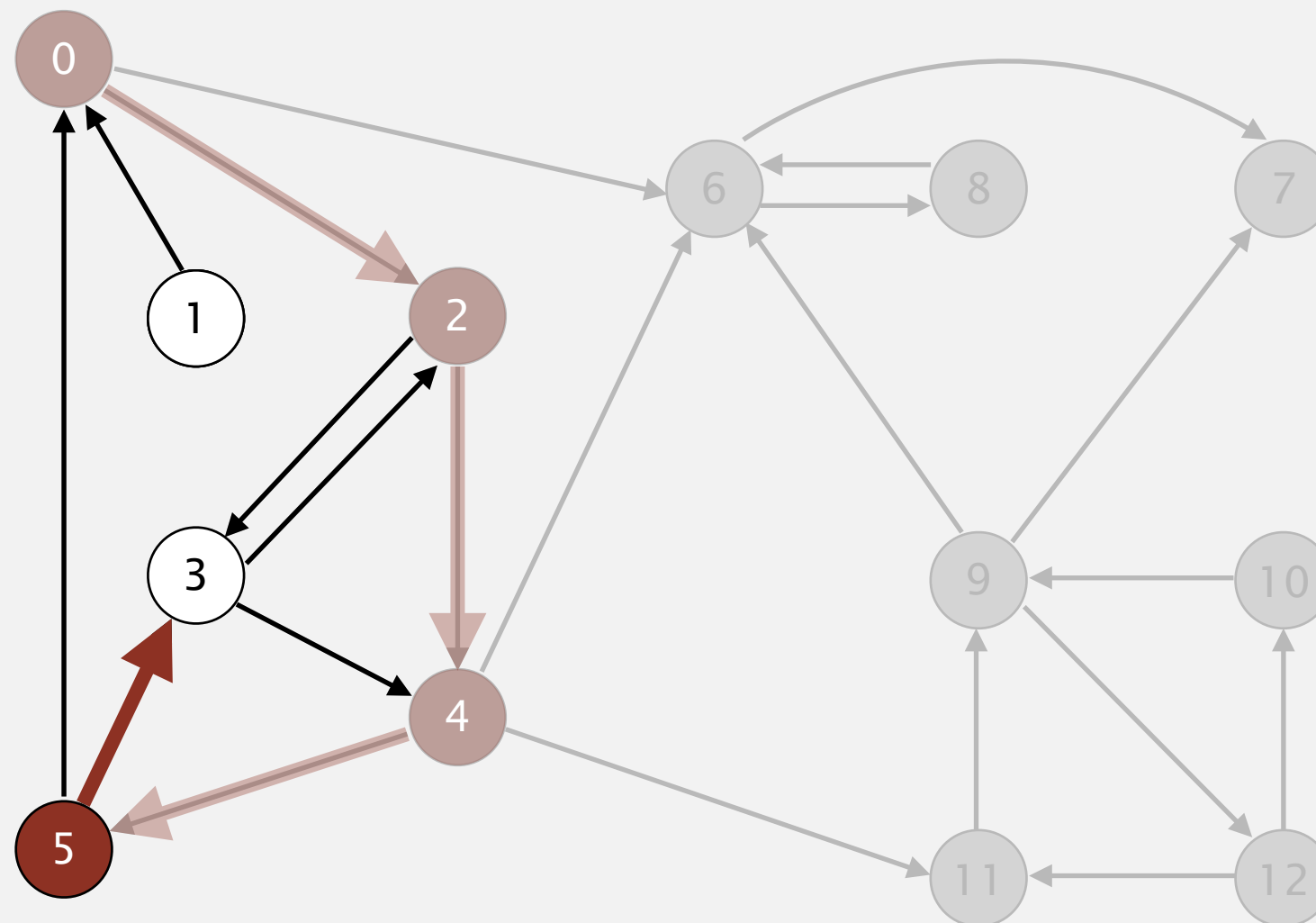


visit 5

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

Phase 1. Compute reverse postorder in G^R .

11 9 12 10 6 7 8

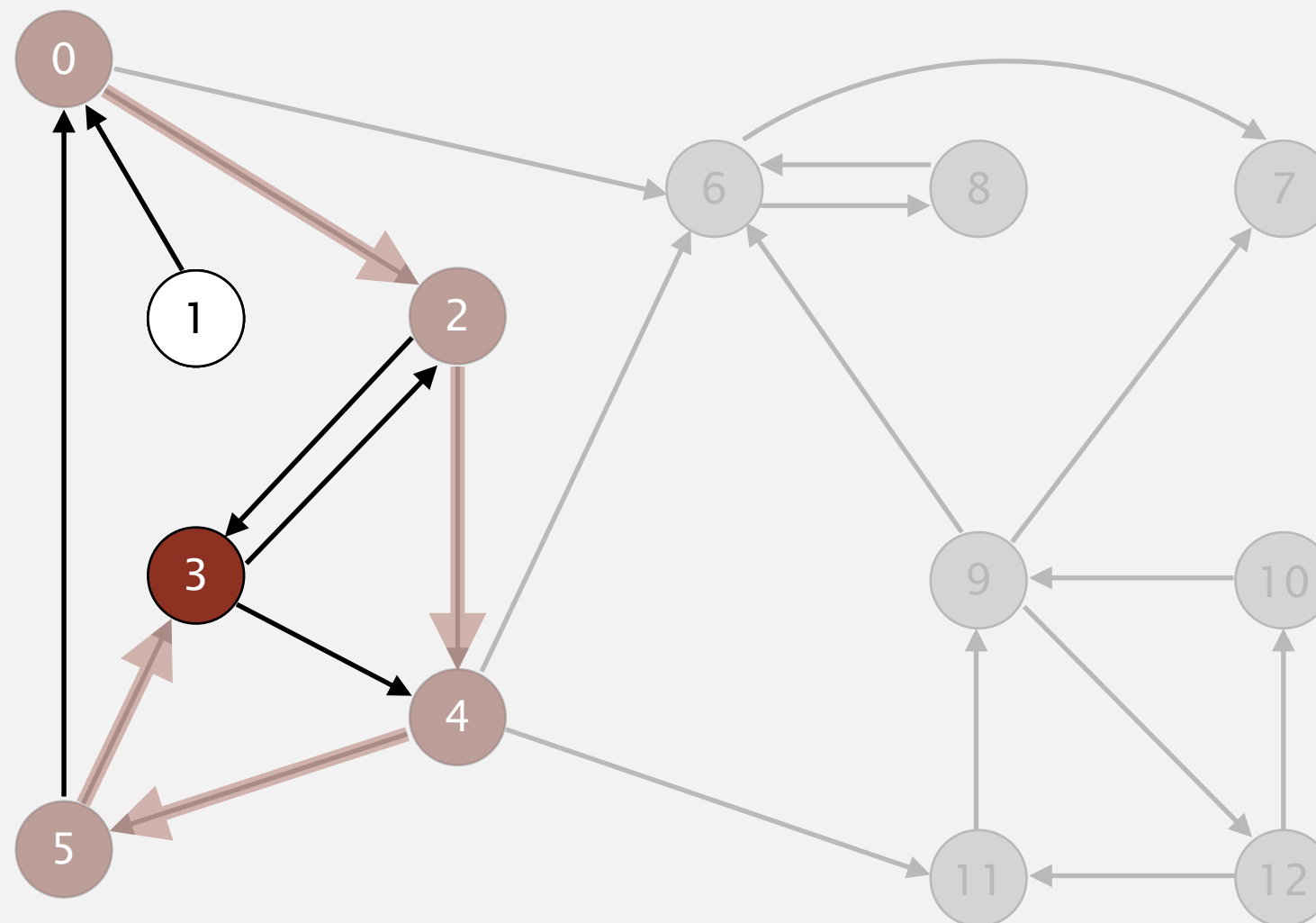


visit 5

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

Phase 1. Compute reverse postorder in G^R .

11 9 12 10 6 7 8

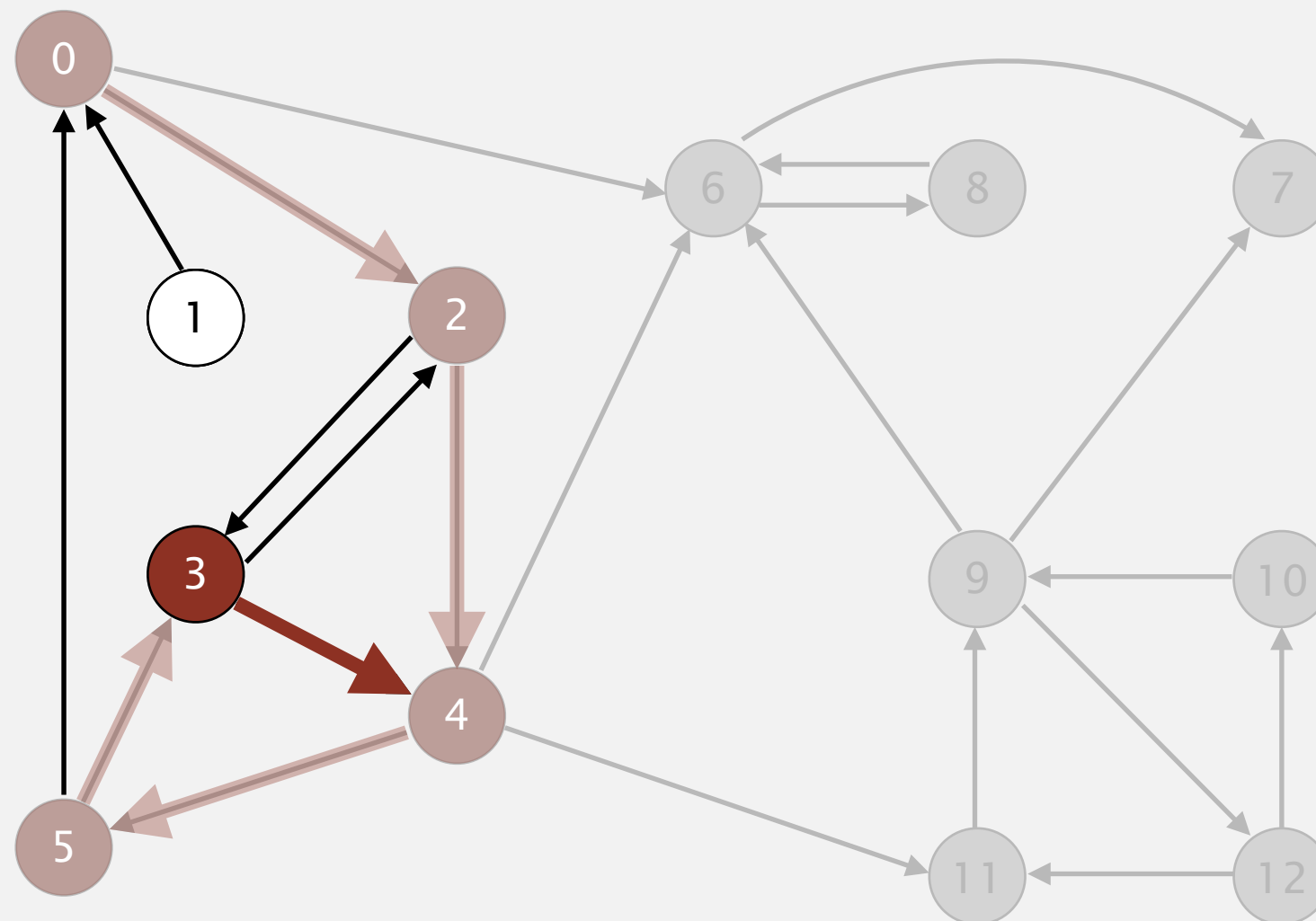


visit 3

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

Phase 1. Compute reverse postorder in G^R .

11 9 12 10 6 7 8

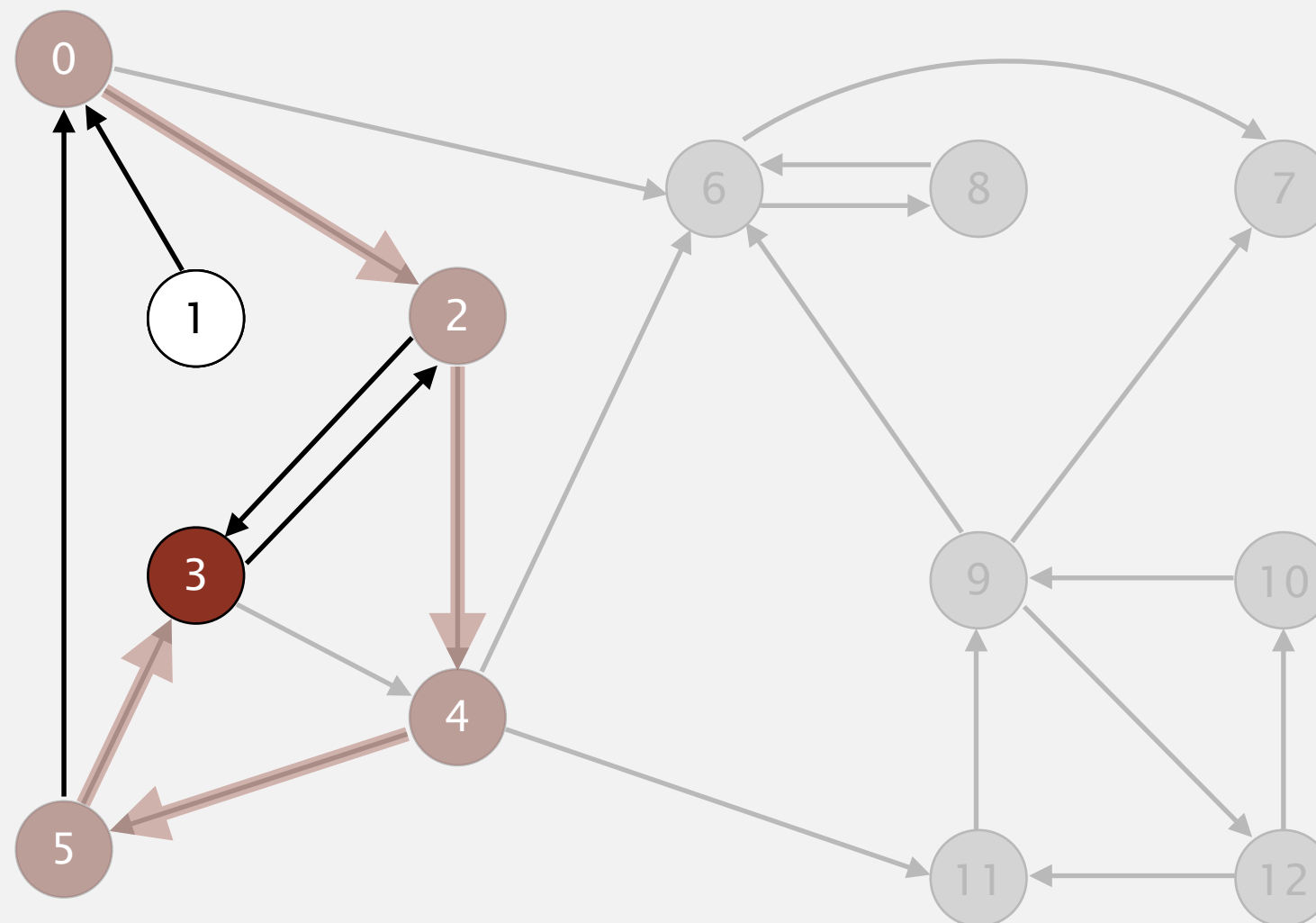


visit 3

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

Phase 1. Compute reverse postorder in G^R .

11 9 12 10 6 7 8

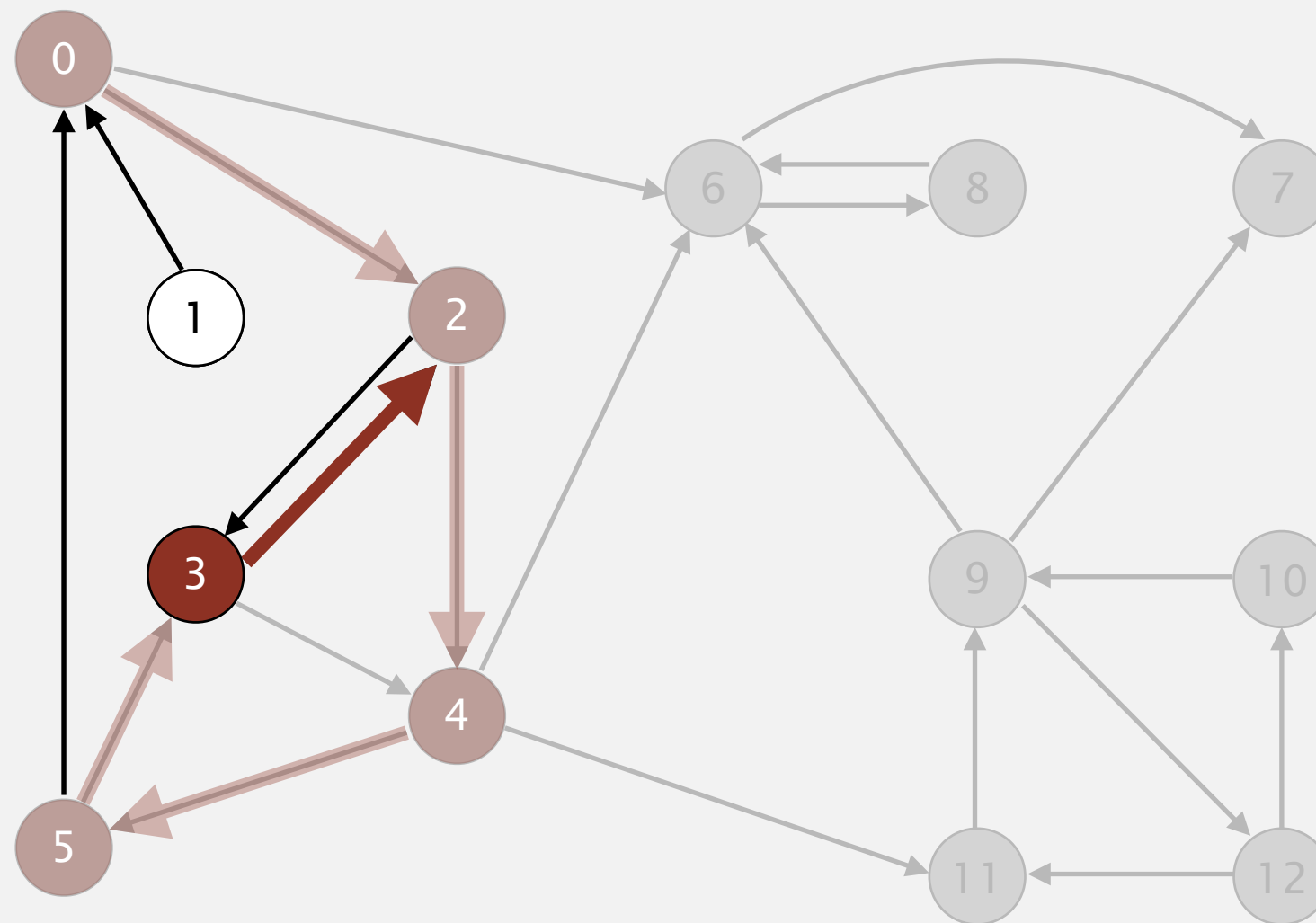


visit 3

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

Phase 1. Compute reverse postorder in G^R .

11 9 12 10 6 7 8

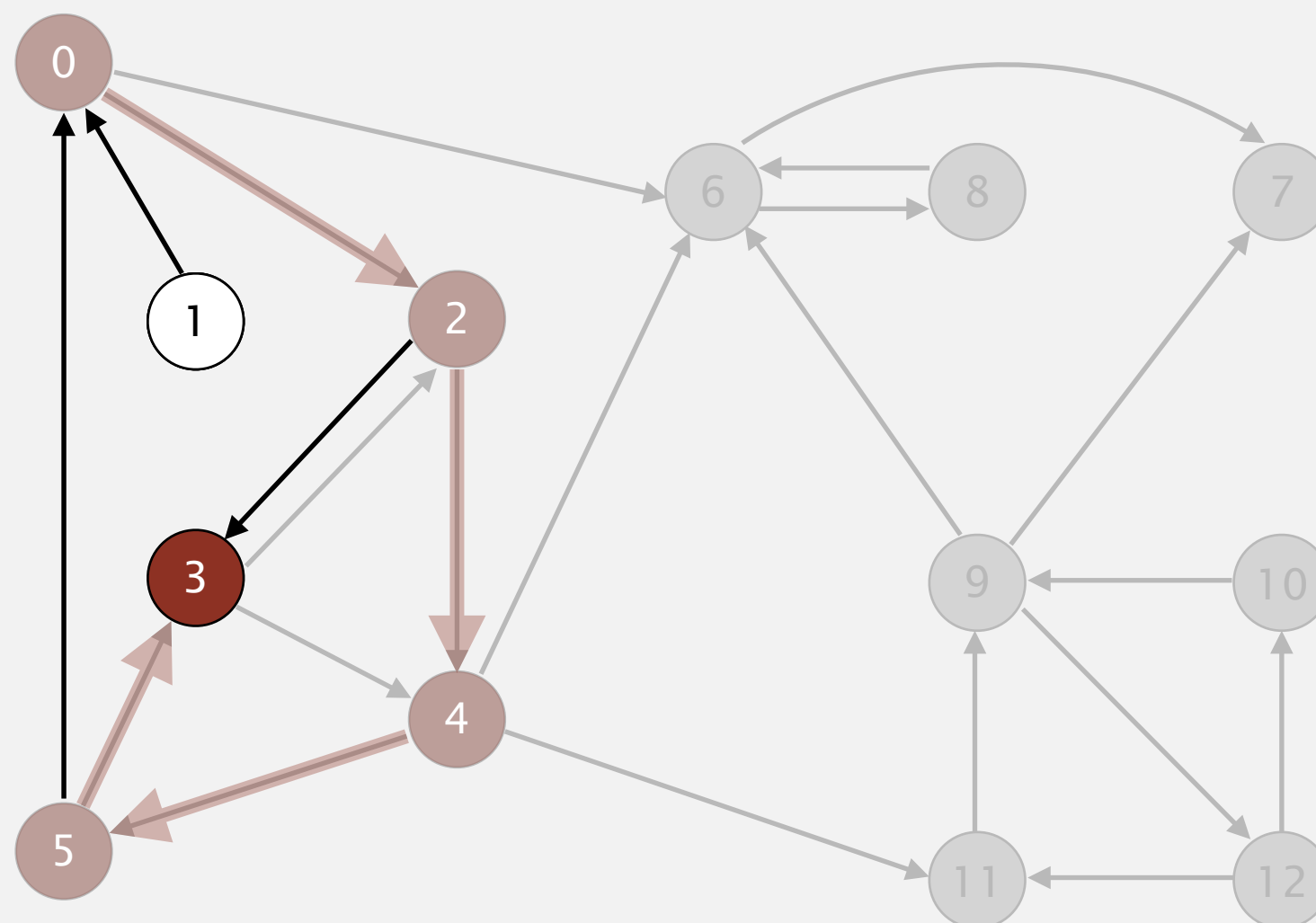


visit 3

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

Phase 1. Compute reverse postorder in G^R .

3 11 9 12 10 6 7 8

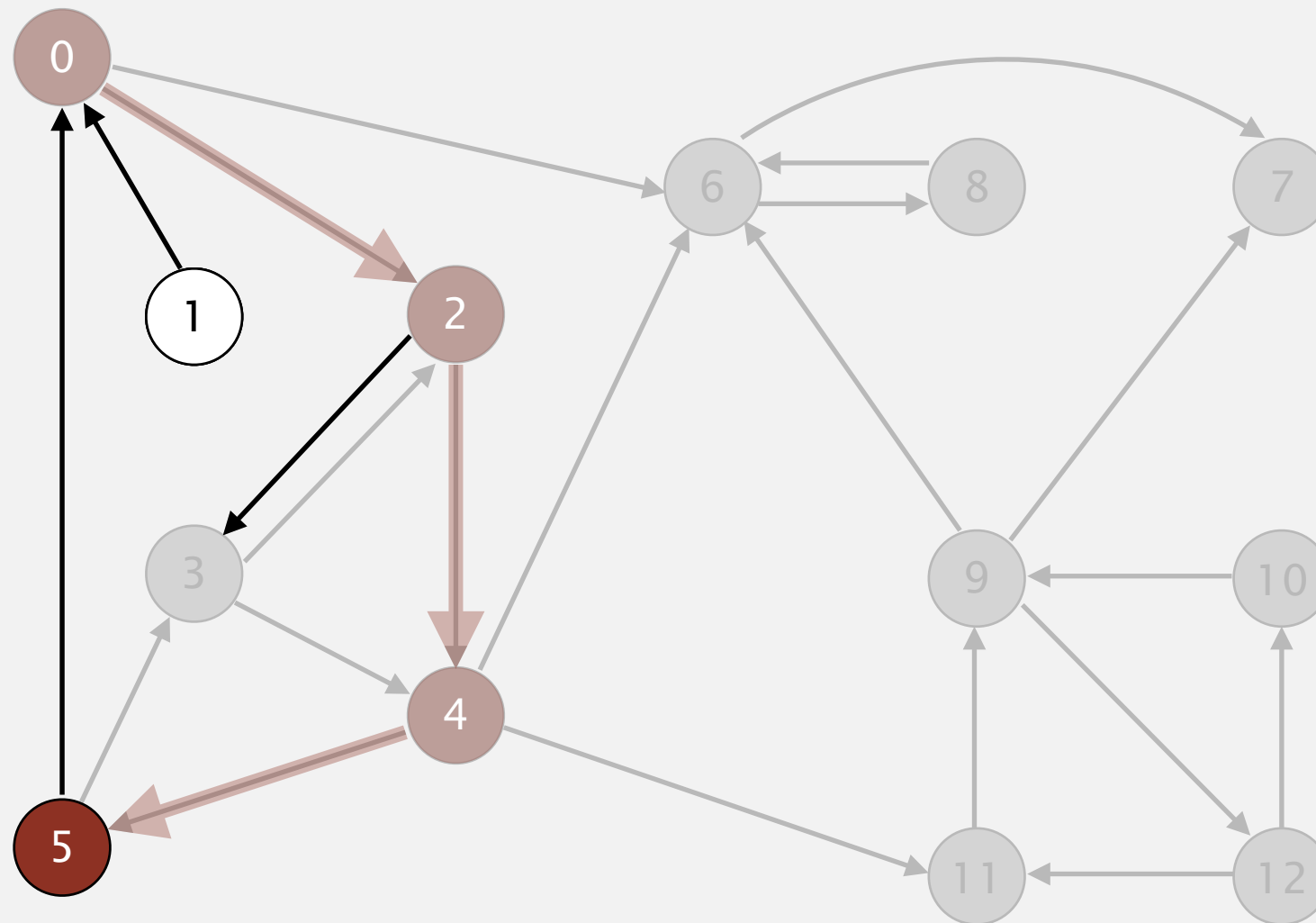


3 done

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

Phase 1. Compute reverse postorder in G^R .

3 11 9 12 10 6 7 8

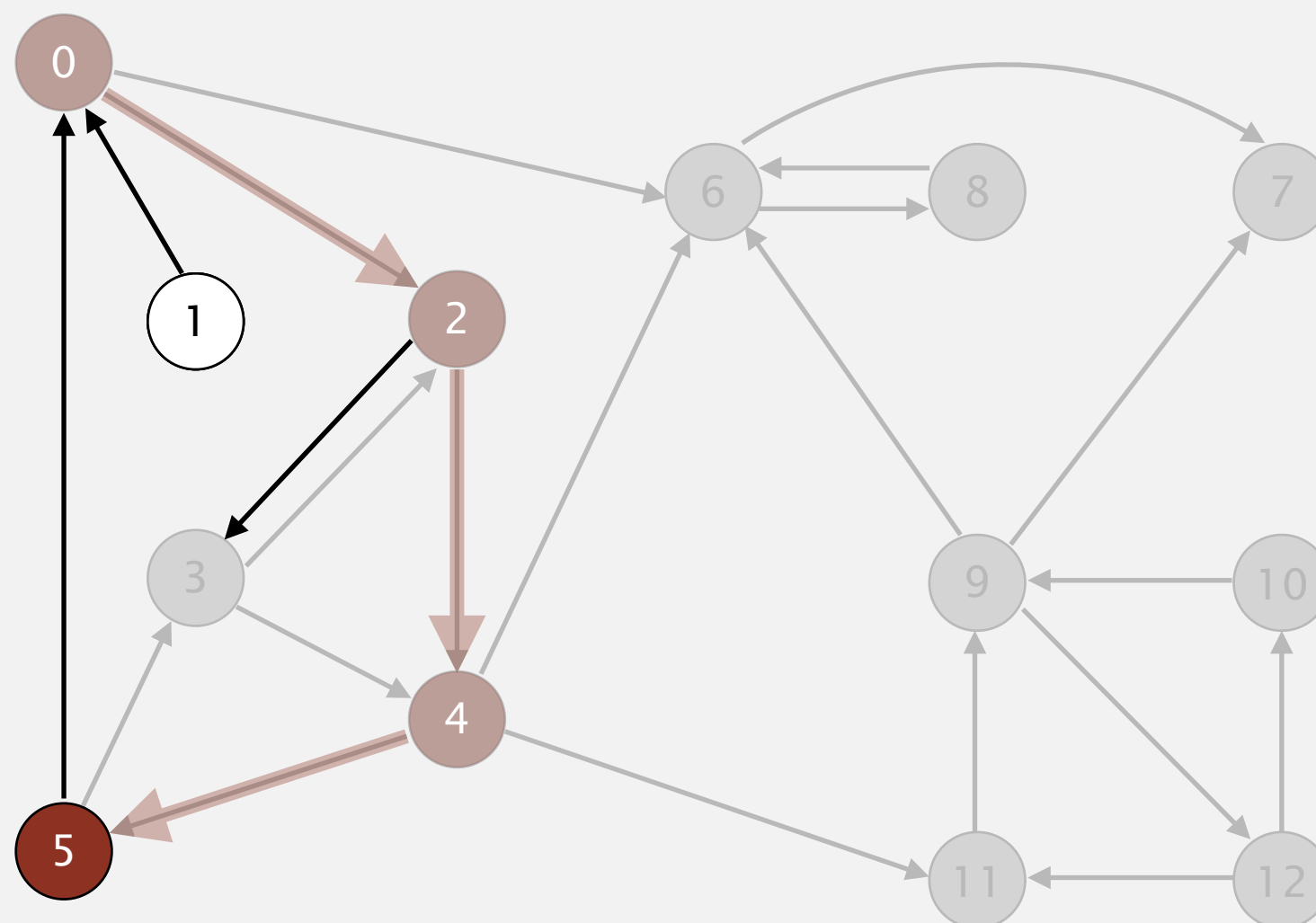


3 done

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

Phase 1. Compute reverse postorder in G^R .

3 11 9 12 10 6 7 8

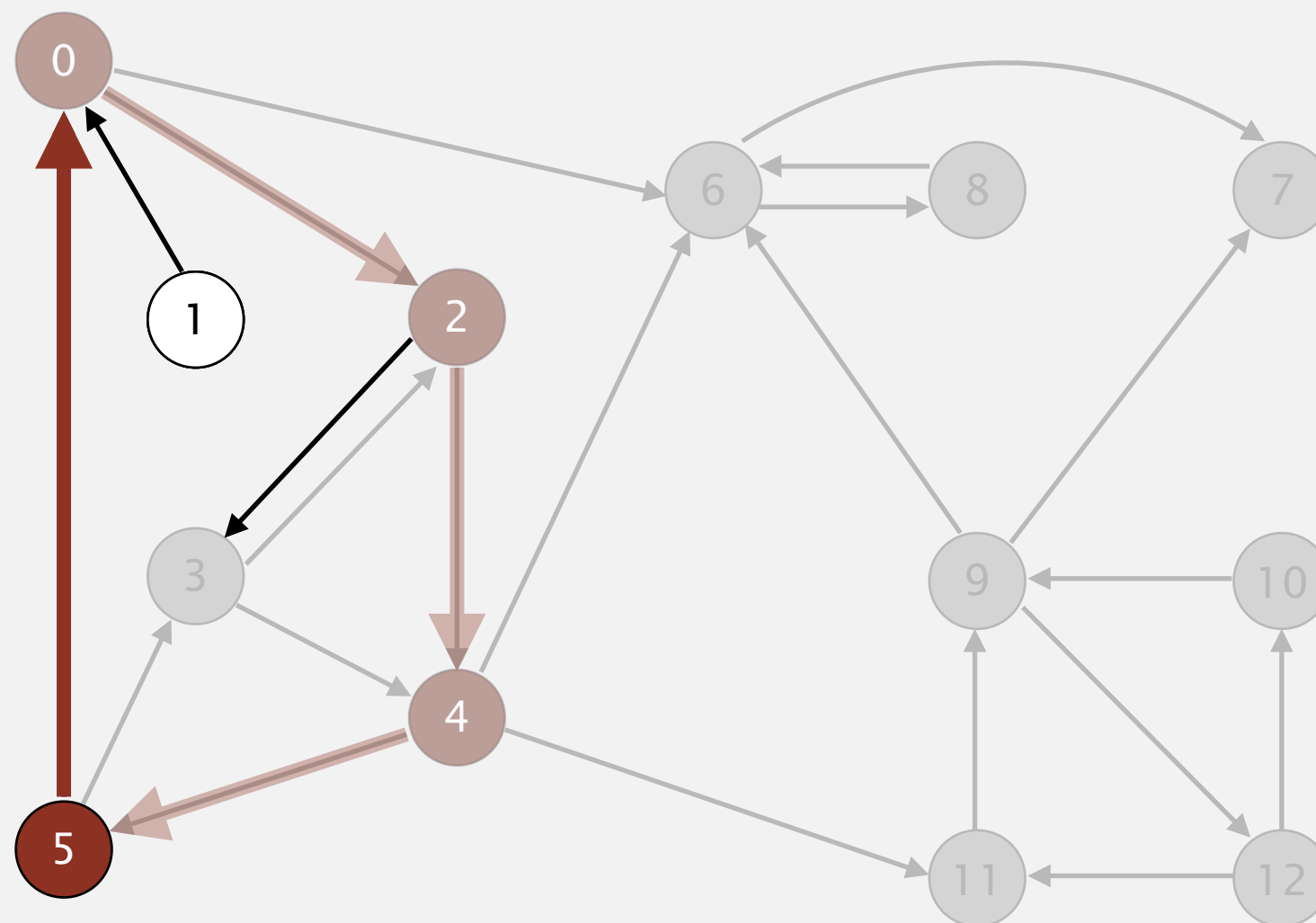


visit 5

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

Phase 1. Compute reverse postorder in G^R .

3 11 9 12 10 6 7 8

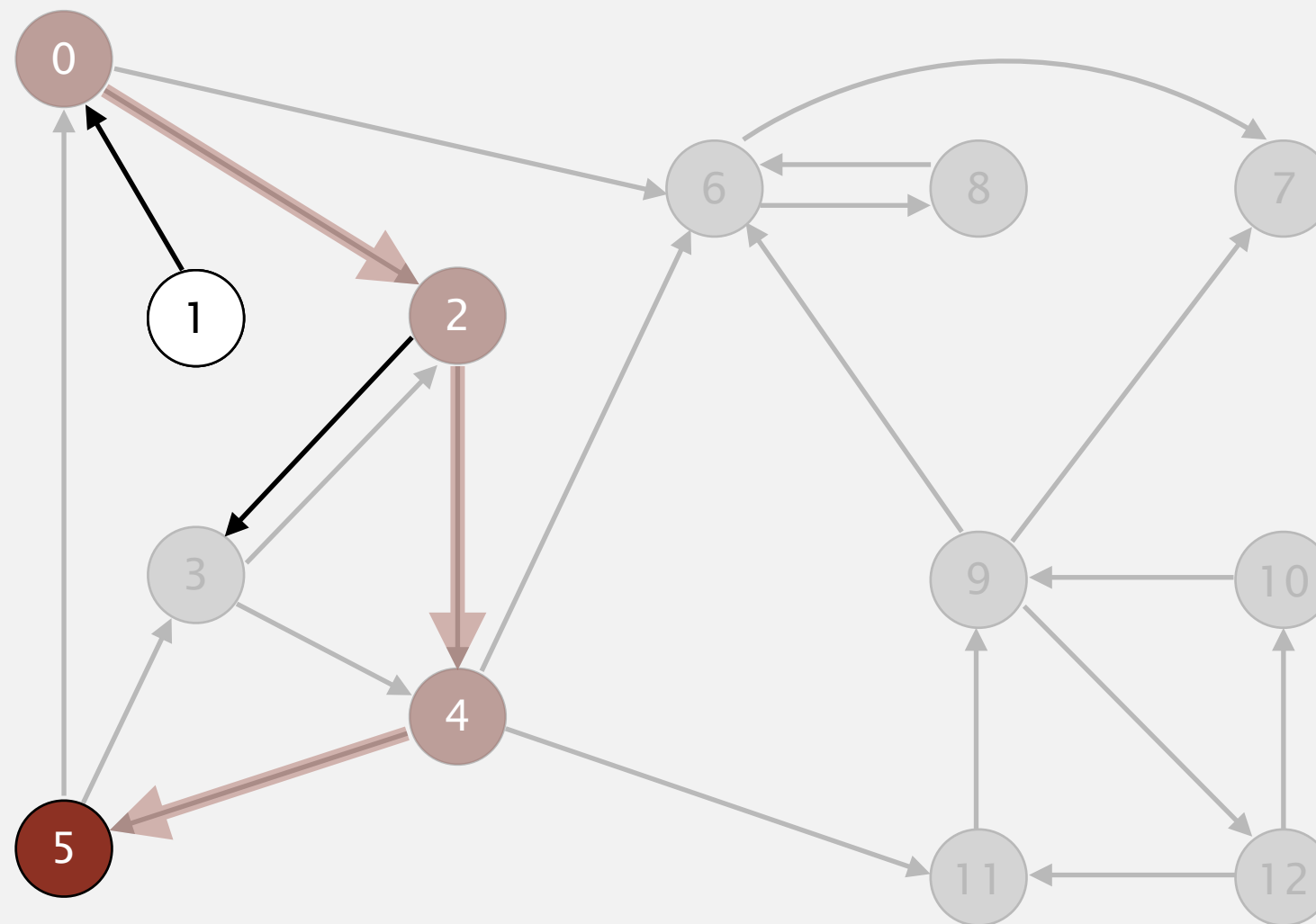


visit 5

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

Phase 1. Compute reverse postorder in G^R .

5 3 11 9 12 10 6 7 8

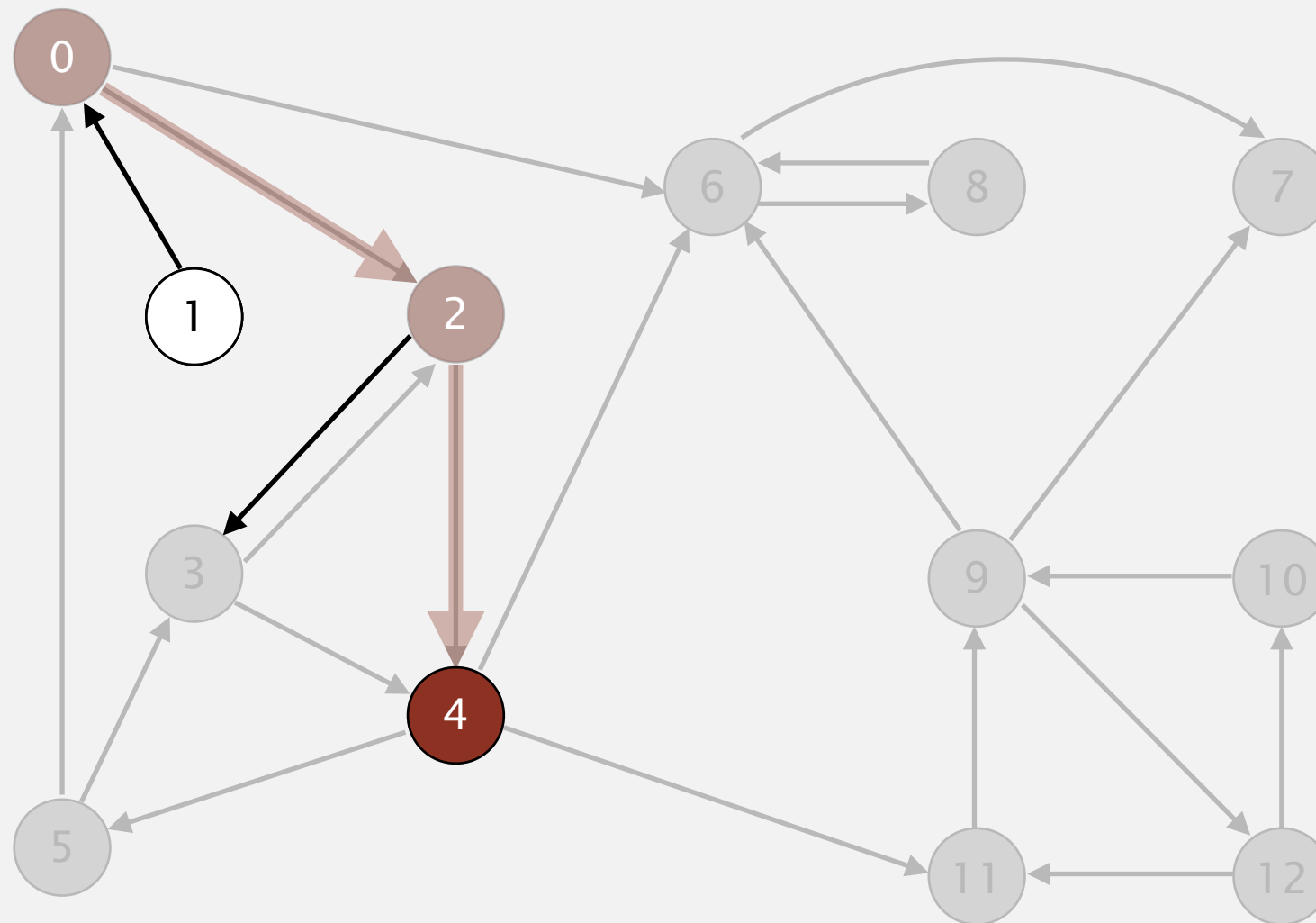


5 done

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

Phase 1. Compute reverse postorder in G^R .

5 3 11 9 12 10 6 7 8

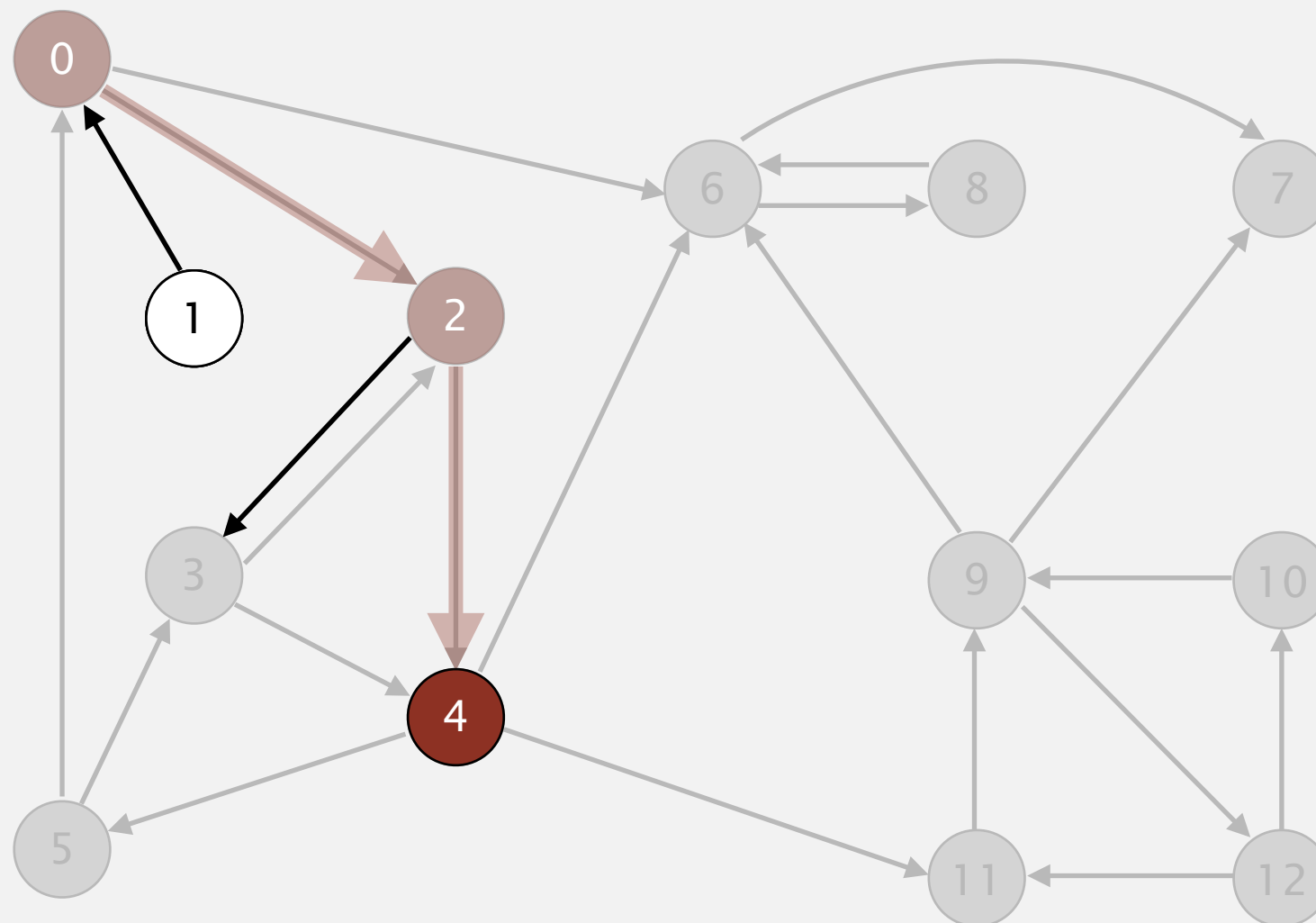


5 done

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

Phase 1. Compute reverse postorder in G^R .

4 5 3 11 9 12 10 6 7 8

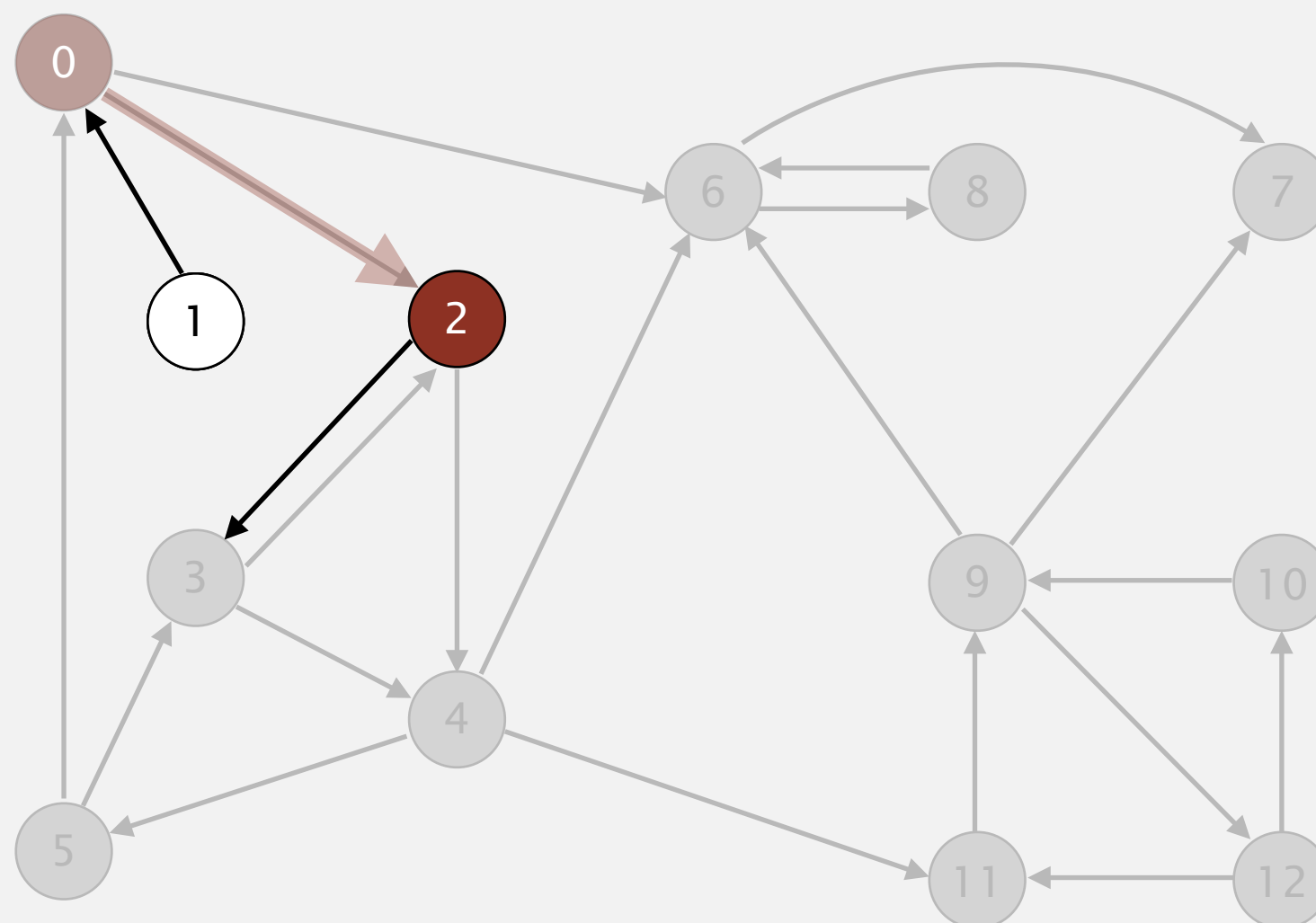


4 done

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

Phase 1. Compute reverse postorder in G^R .

4 5 3 11 9 12 10 6 7 8

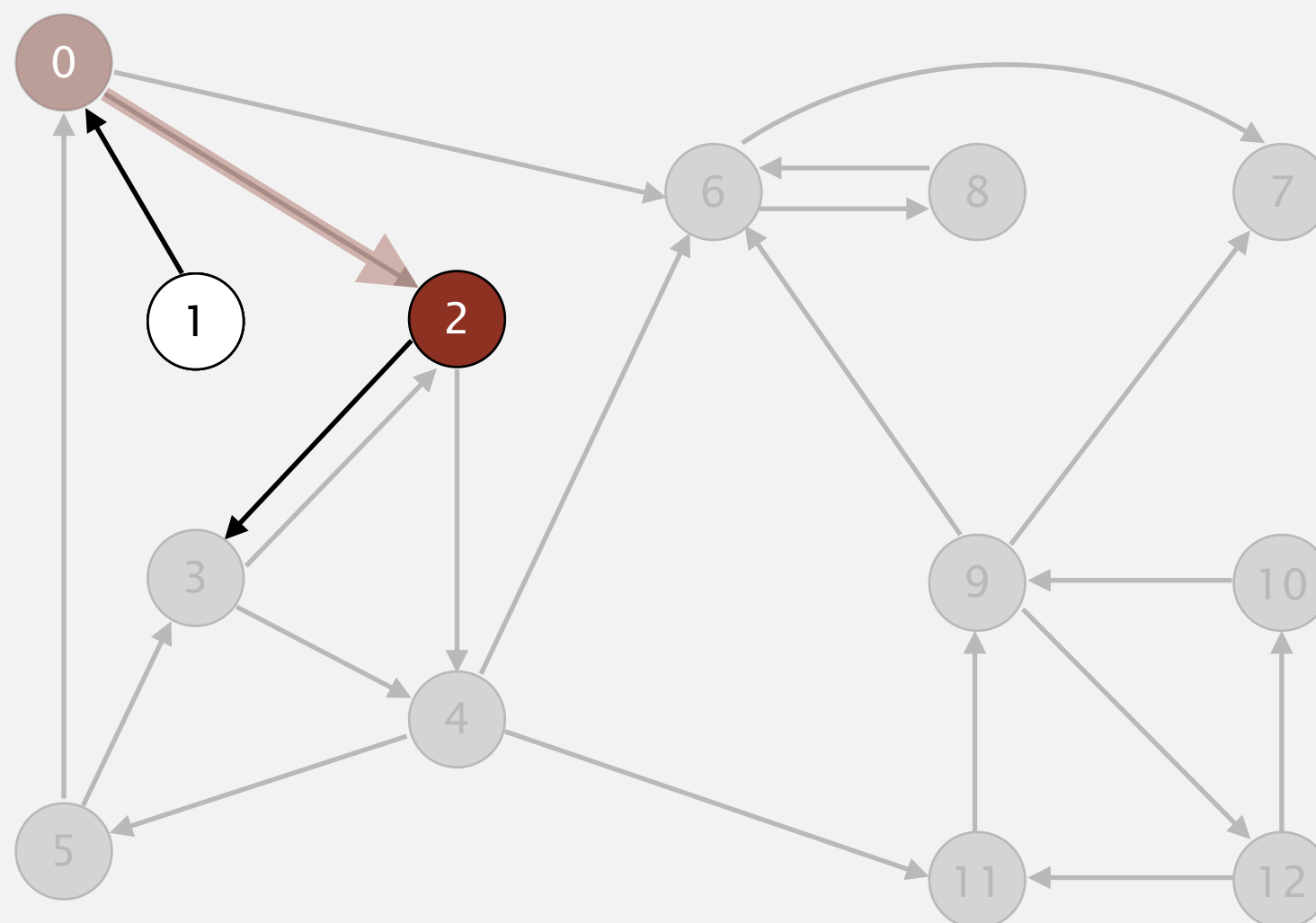


4 done

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

Phase 1. Compute reverse postorder in G^R .

4 5 3 11 9 12 10 6 7 8

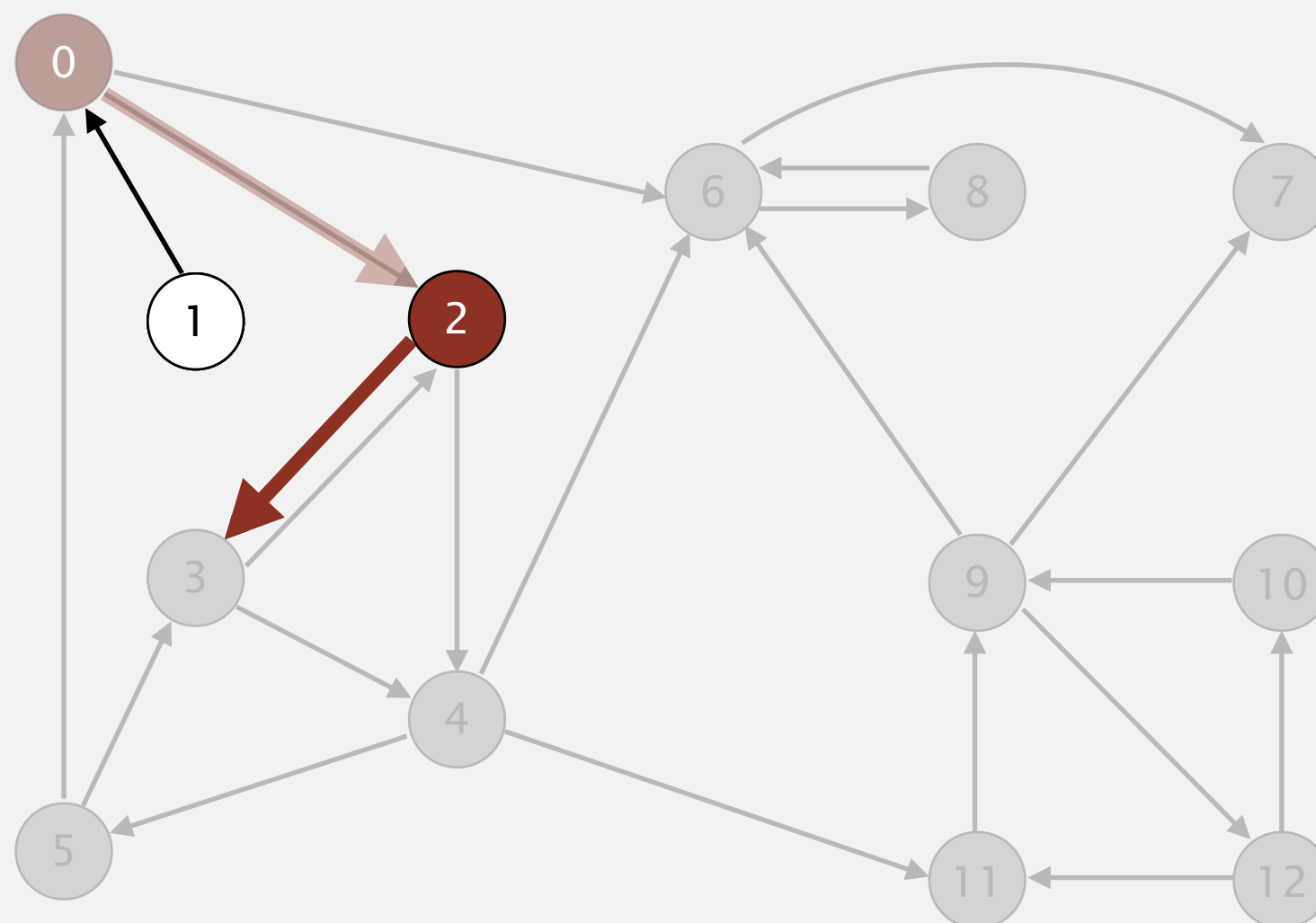


visit 2

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

Phase 1. Compute reverse postorder in G^R .

4 5 3 11 9 12 10 6 7 8

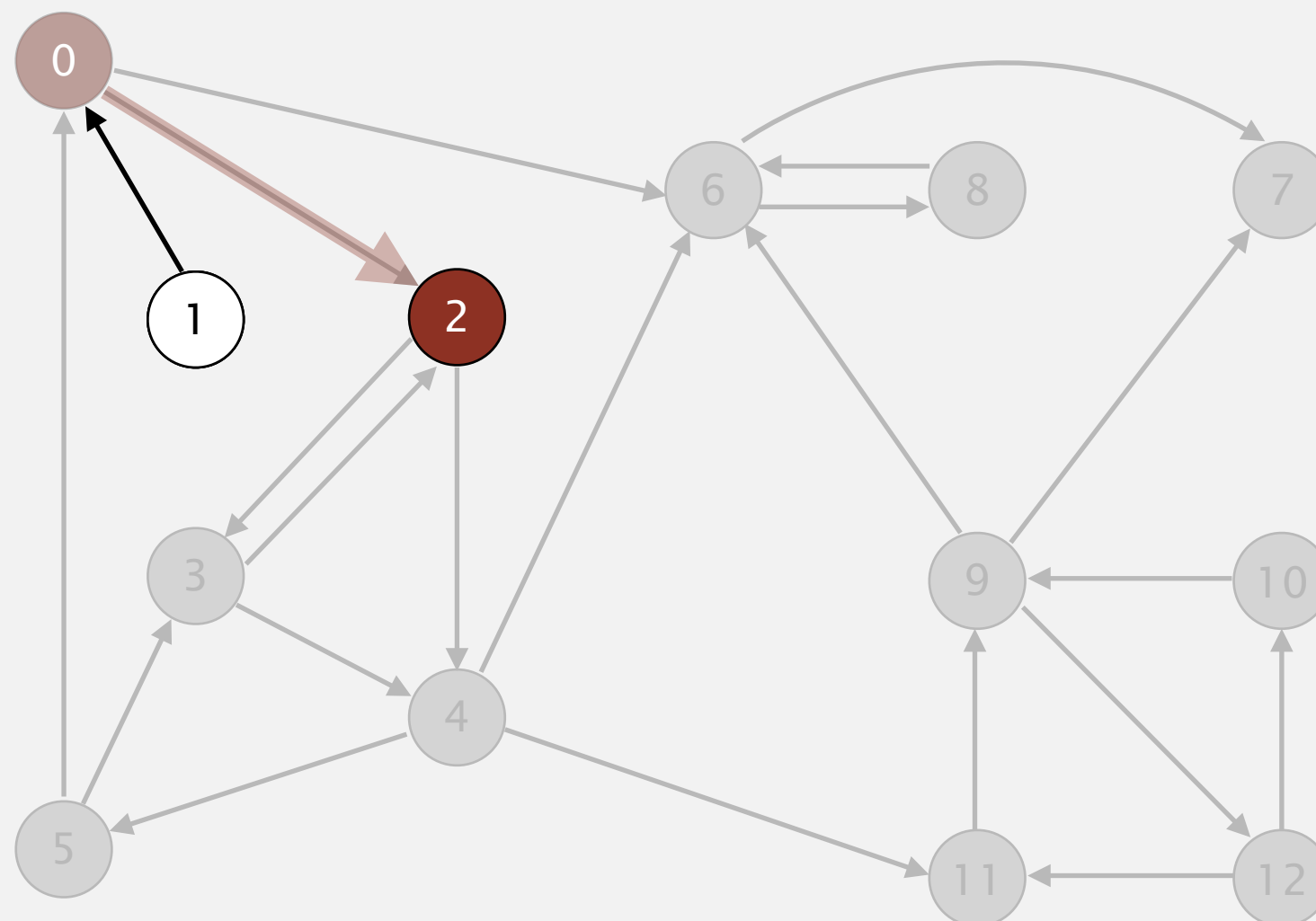


| v | marked[v] |
|----|-----------|
| 0 | T |
| 1 | F |
| 2 | T |
| 3 | T |
| 4 | T |
| 5 | T |
| 6 | T |
| 7 | T |
| 8 | T |
| 9 | T |
| 10 | T |
| 11 | T |
| 12 | T |

visit 2

Phase 1. Compute reverse postorder in G^R .

2 4 5 3 11 9 12 10 6 7 8

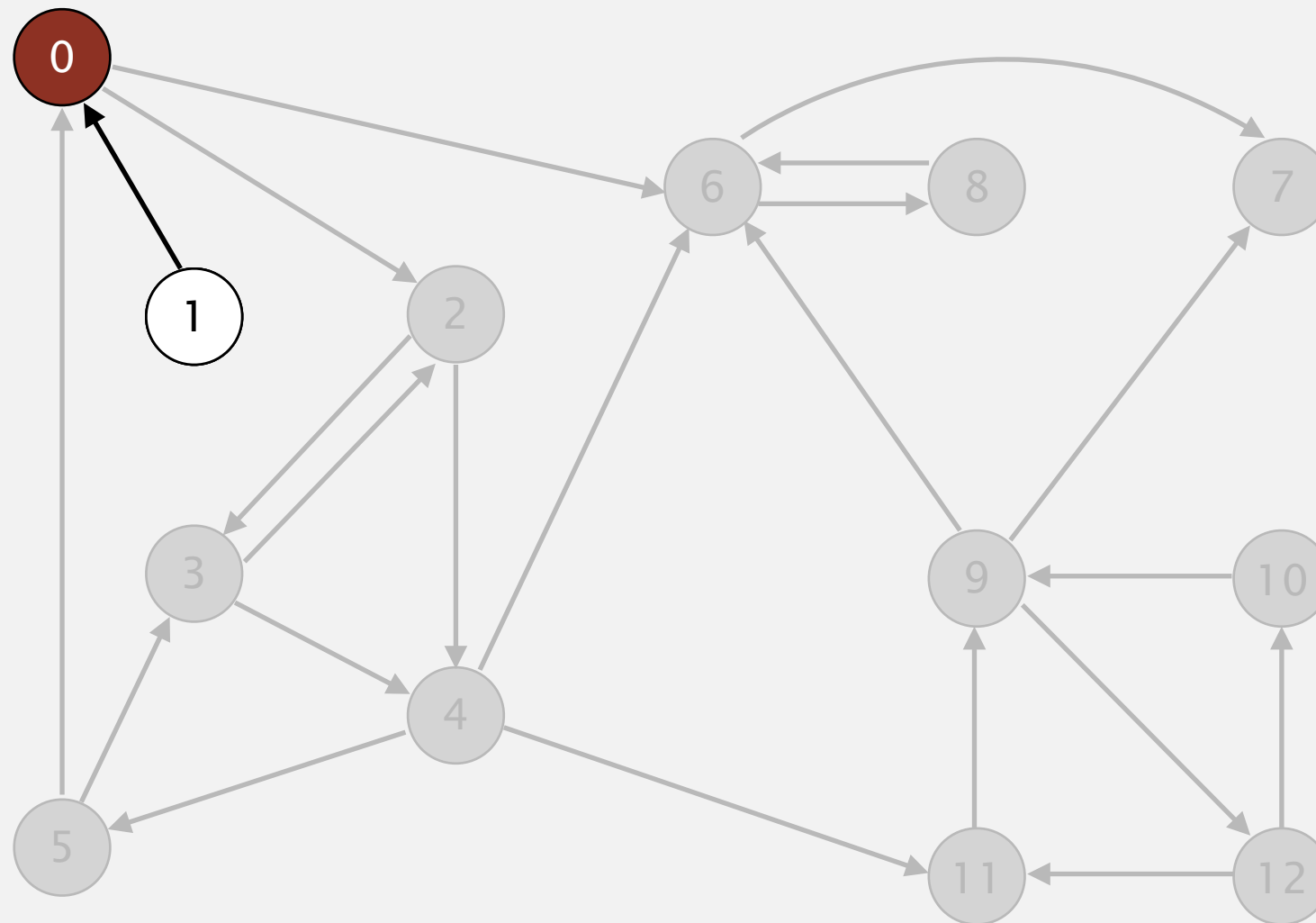


2 done

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

Phase 1. Compute reverse postorder in G^R .

2 4 5 3 11 9 12 10 6 7 8

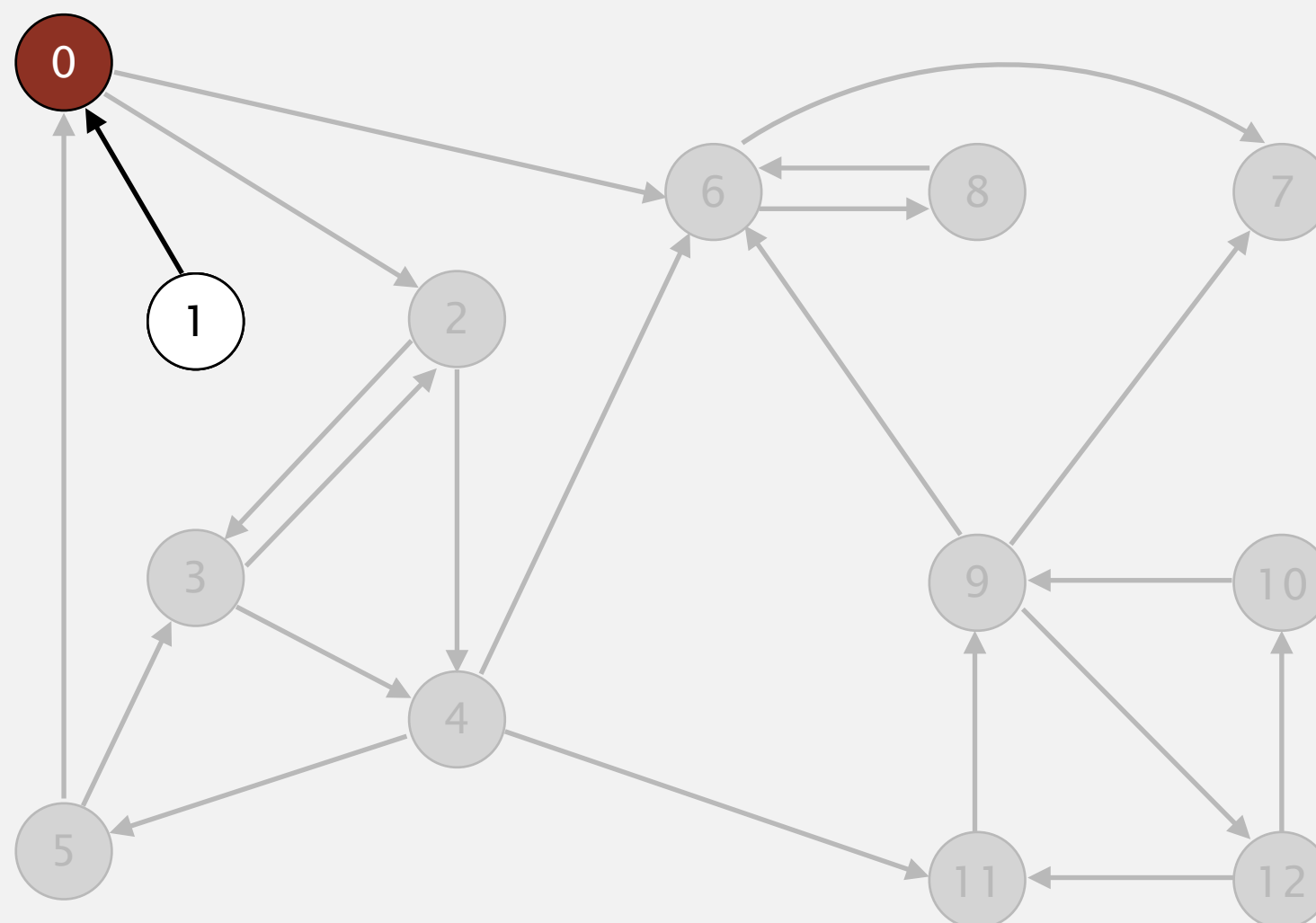


| v | marked[v] |
|----|-----------|
| 0 | T |
| 1 | F |
| 2 | T |
| 3 | T |
| 4 | T |
| 5 | T |
| 6 | T |
| 7 | T |
| 8 | T |
| 9 | T |
| 10 | T |
| 11 | T |
| 12 | T |

2 done

Phase 1. Compute reverse postorder in G^R .

0 2 4 5 3 11 9 12 10 6 7 8

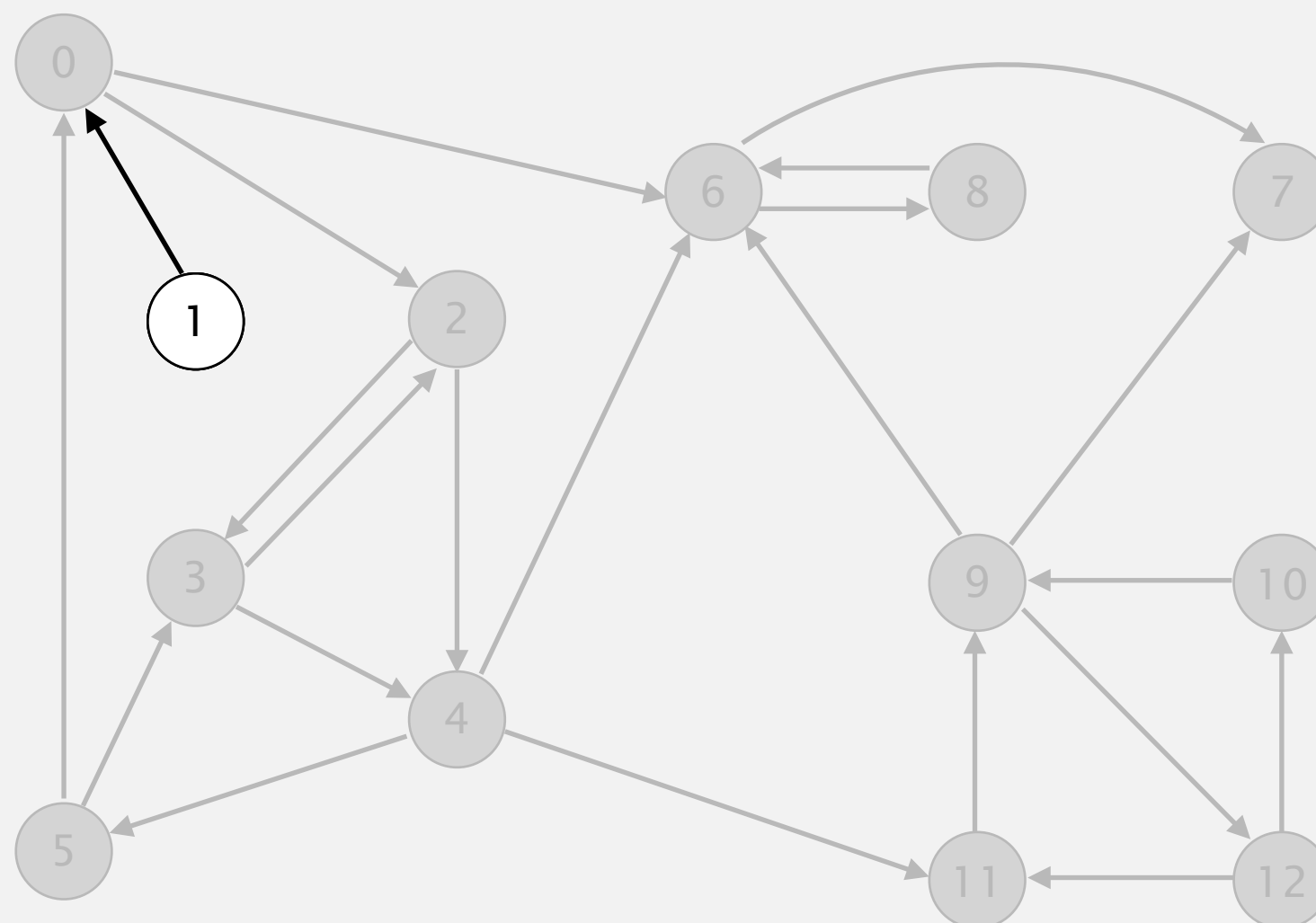


| v | marked[v] |
|----|-----------|
| 0 | T |
| 1 | F |
| 2 | T |
| 3 | T |
| 4 | T |
| 5 | T |
| 6 | T |
| 7 | T |
| 8 | T |
| 9 | T |
| 10 | T |
| 11 | T |
| 12 | T |

0 done

Phase 1. Compute reverse postorder in G^R .

0 2 4 5 3 11 9 12 10 6 7 8

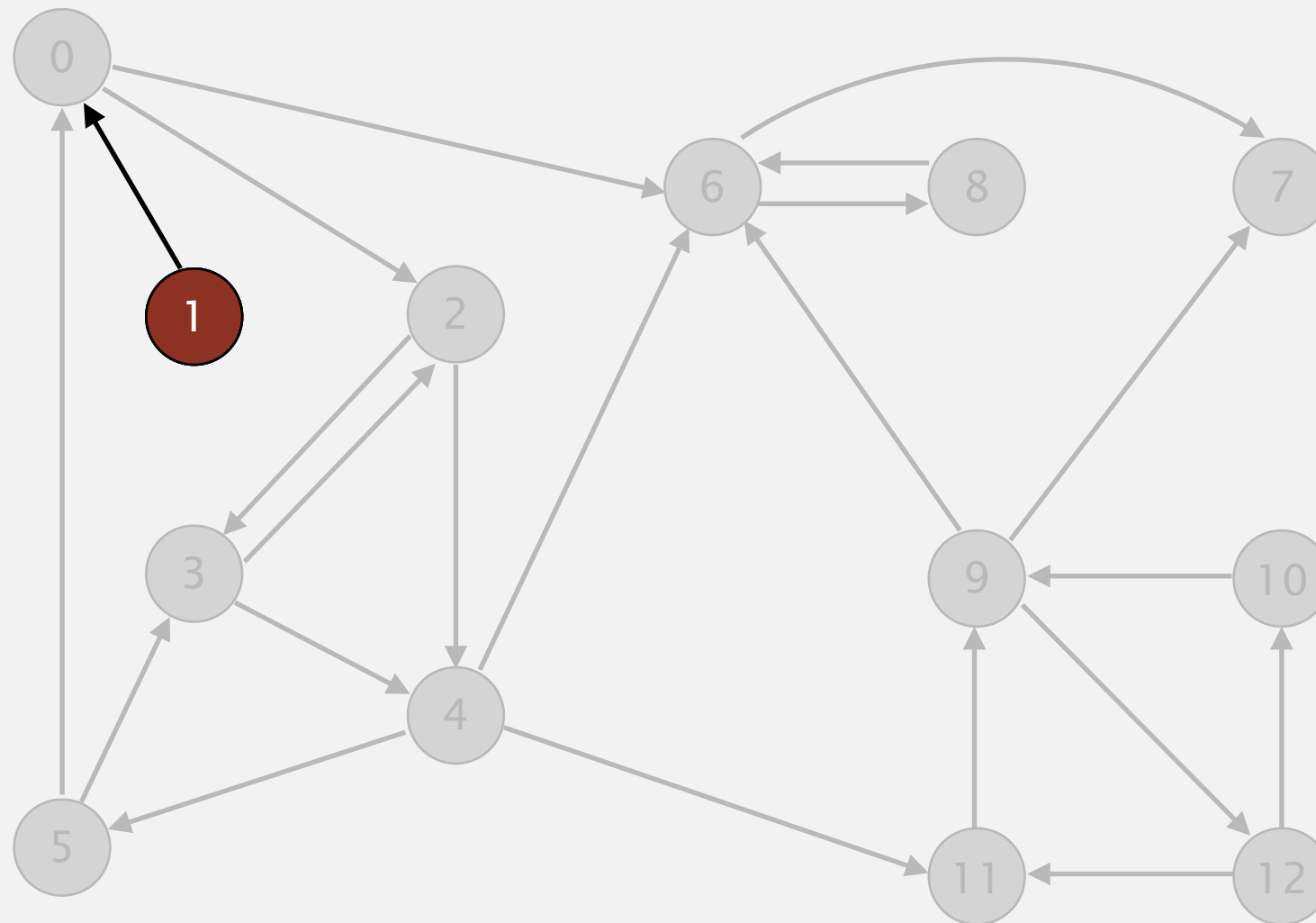


| v | marked[v] |
|----|-----------|
| 0 | T |
| 1 | F |
| 2 | T |
| 3 | T |
| 4 | T |
| 5 | T |
| 6 | T |
| 7 | T |
| 8 | T |
| 9 | T |
| 10 | T |
| 11 | T |
| 12 | T |

0 done

Phase 1. Compute reverse postorder in G^R .

0 2 4 5 3 11 9 12 10 6 7 8

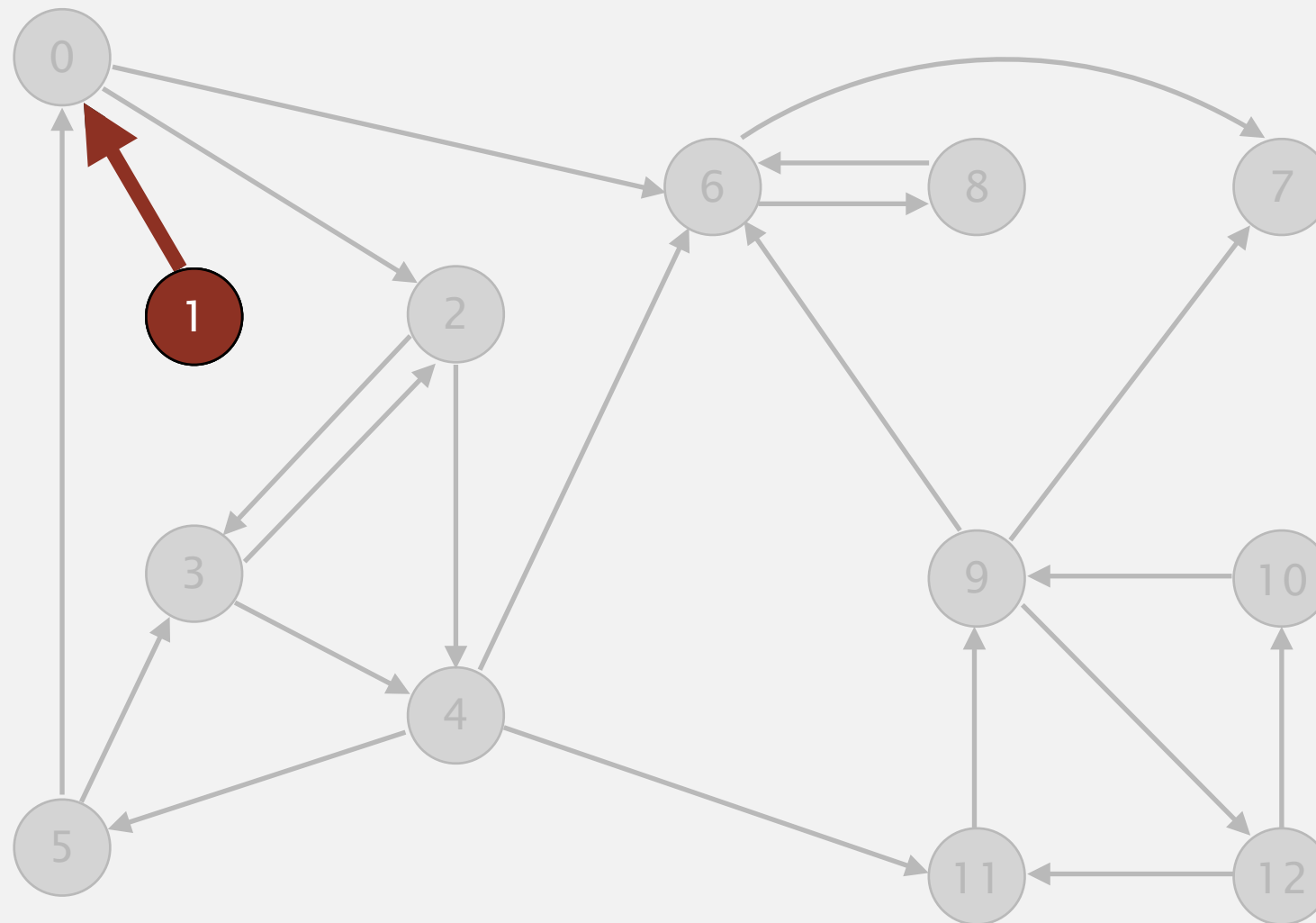


| v | marked[v] |
|----|-----------|
| 0 | T |
| 1 | T |
| 2 | T |
| 3 | T |
| 4 | T |
| 5 | T |
| 6 | T |
| 7 | T |
| 8 | T |
| 9 | T |
| 10 | T |
| 11 | T |
| 12 | T |

visit 1

Phase 1. Compute reverse postorder in G^R .

0 2 4 5 3 11 9 12 10 6 7 8

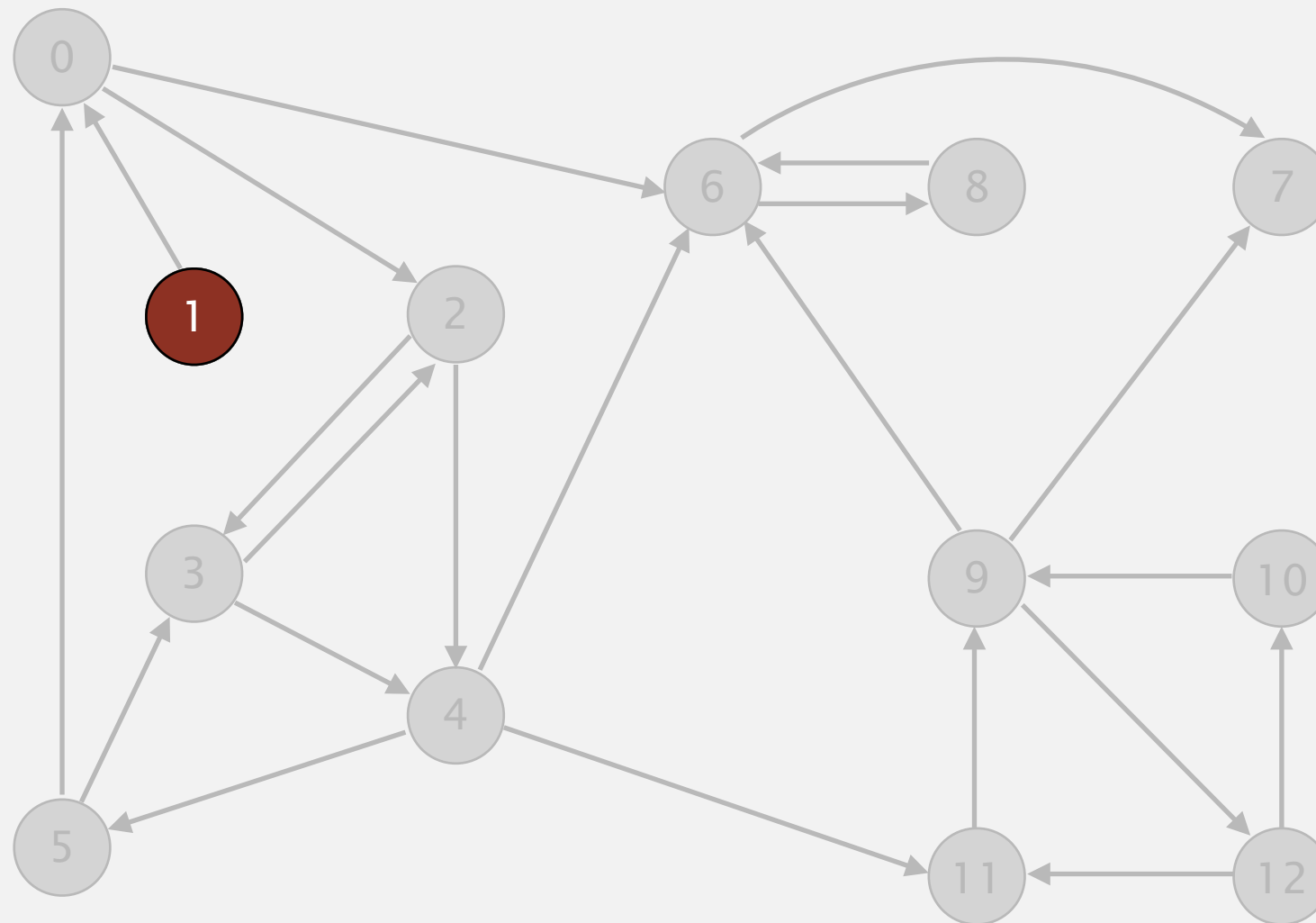


| v | marked[v] |
|----|-----------|
| 0 | T |
| 1 | T |
| 2 | T |
| 3 | T |
| 4 | T |
| 5 | T |
| 6 | T |
| 7 | T |
| 8 | T |
| 9 | T |
| 10 | T |
| 11 | T |
| 12 | T |

visit 1

Phase 1. Compute reverse postorder in G^R .

1 0 2 4 5 3 11 9 12 10 6 7 8

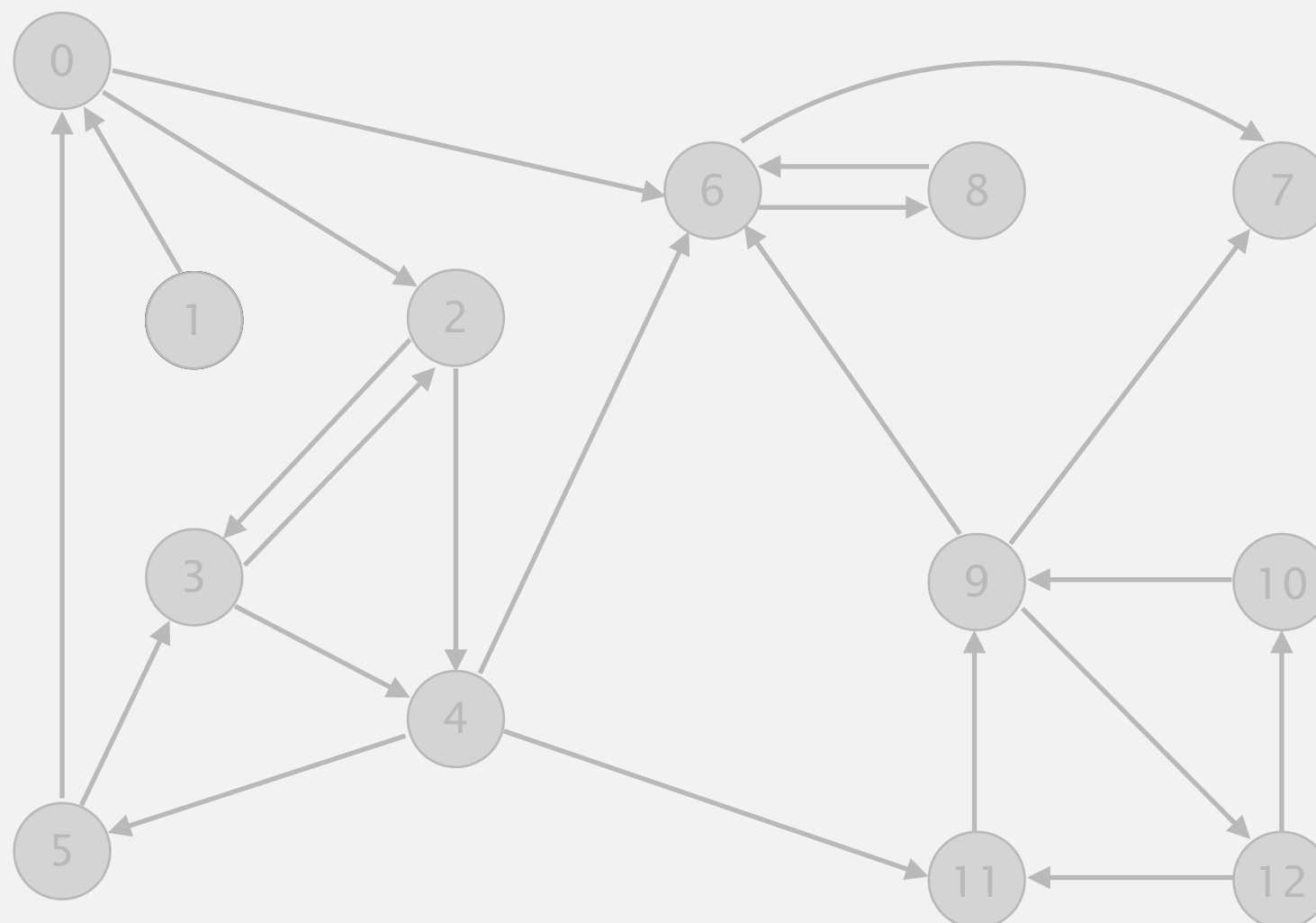


1 done

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

Phase 1. Compute reverse postorder in G^R .

1 0 2 4 5 3 11 9 12 10 6 7 8

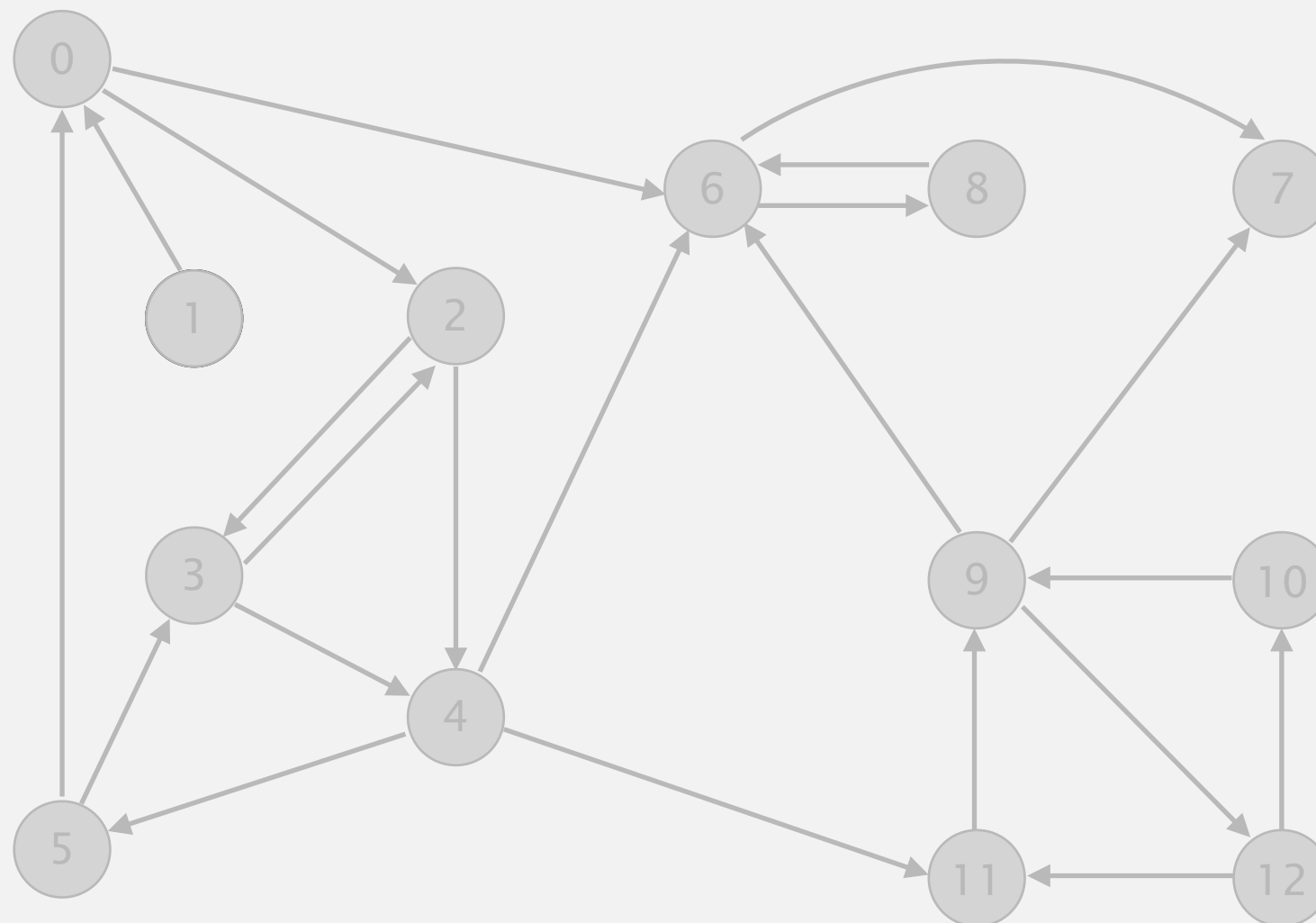


1 done

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

Phase 1. Compute reverse postorder in G^R .

1 0 2 4 5 3 11 9 12 10 6 7 8

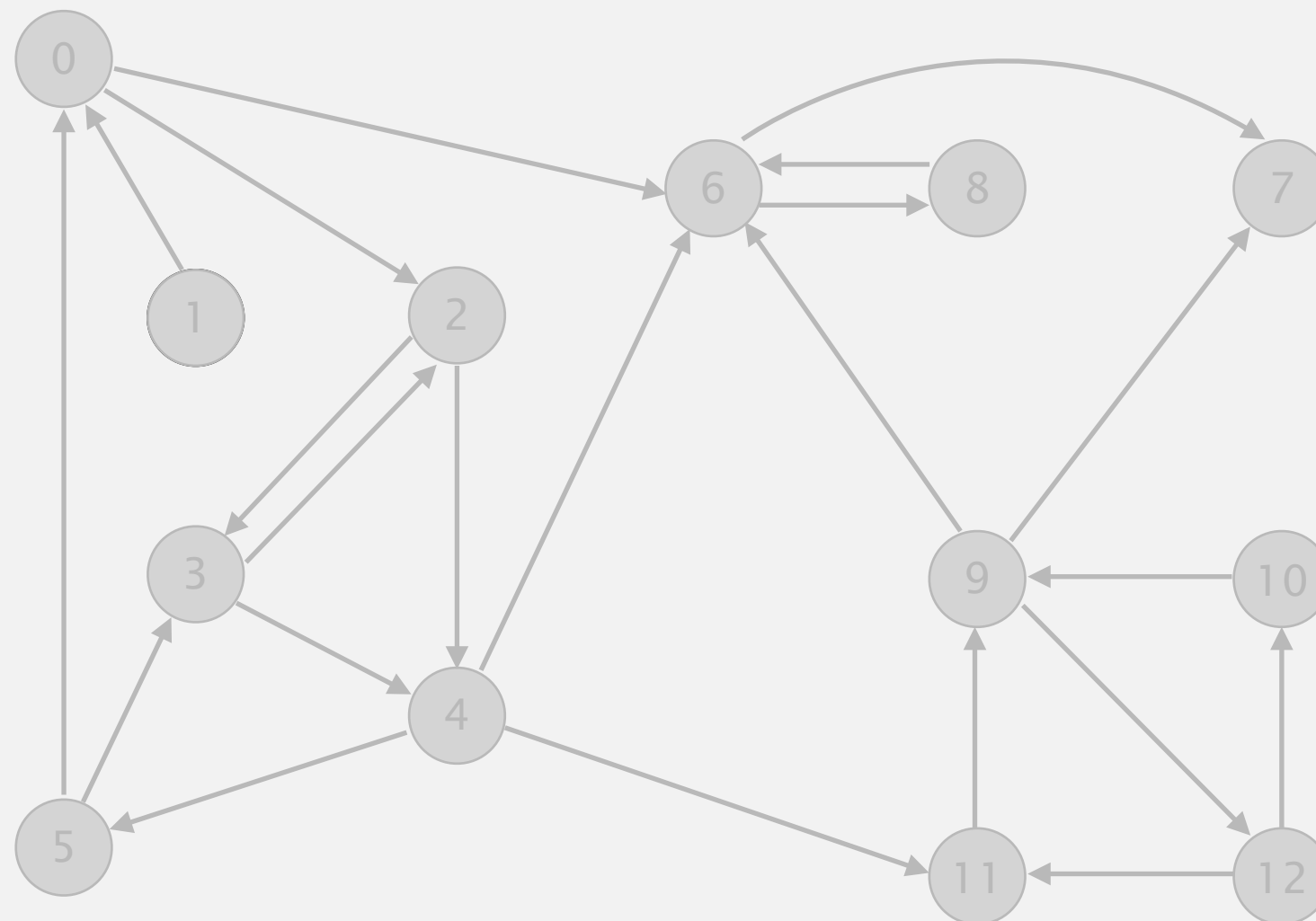


| v | marked[v] |
|----|-----------|
| 0 | T |
| 1 | T |
| 2 | T |
| 3 | T |
| 4 | T |
| 5 | T |
| 6 | T |
| 7 | T |
| 8 | T |
| 9 | T |
| 10 | T |
| 11 | T |
| 12 | T |

check 2 3 4 5 6 7 8 9 10 11 12

Phase 1. Compute reverse postorder in G^R .

1 0 2 4 5 3 11 9 12 10 6 7 8

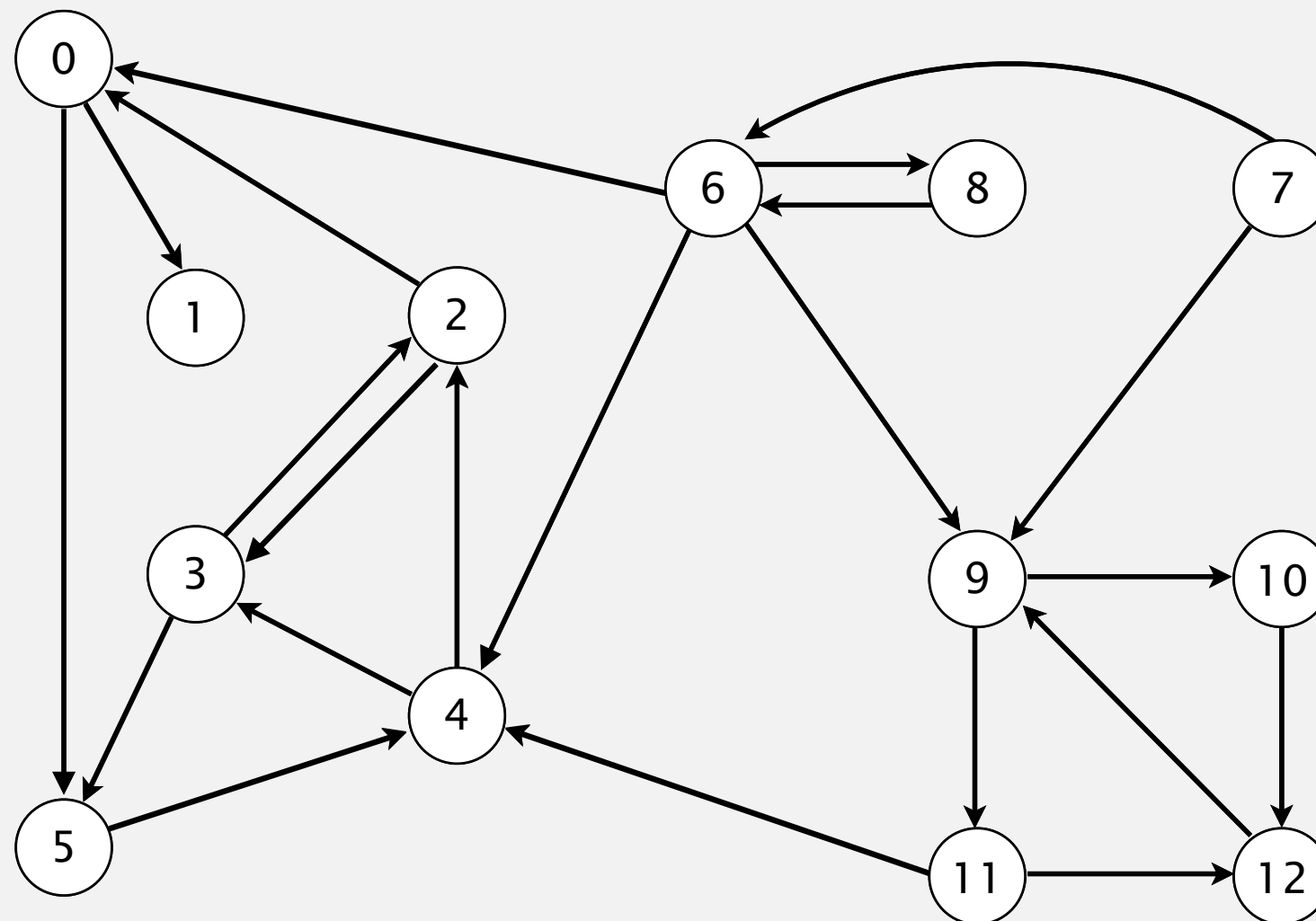


reverse digraph G^R

- ▶ DFS in reverse graph
- ▶ **DFS in original graph**

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 0 2 4 5 3 11 9 12 10 6 7 8

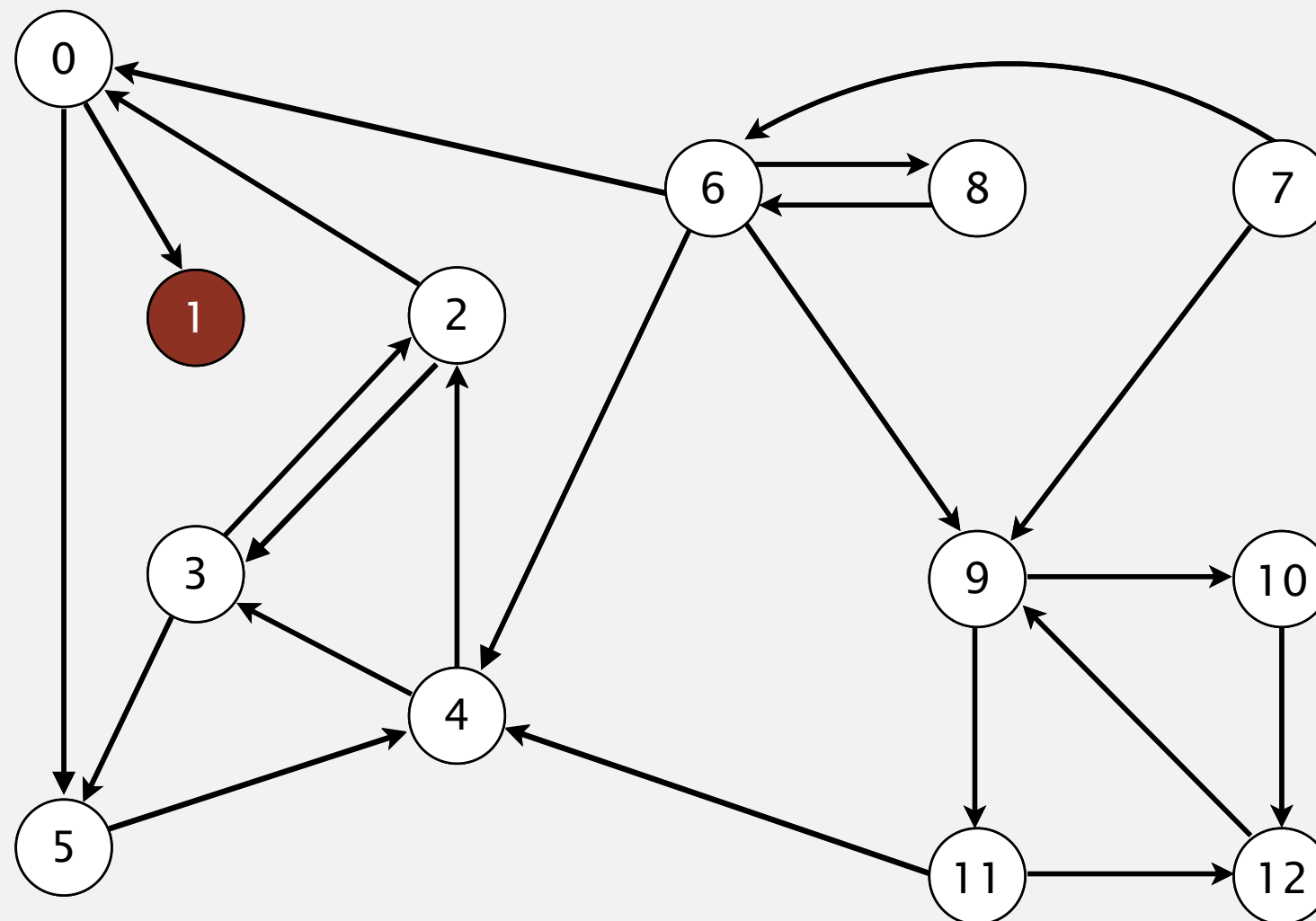


original digraph G

| v | scc[v] |
|----------|---------------|
| 0 | - |
| 1 | - |
| 2 | - |
| 3 | - |
| 4 | - |
| 5 | - |
| 6 | - |
| 7 | - |
| 8 | - |
| 9 | - |
| 10 | - |
| 11 | - |
| 12 | - |

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

① 0 2 4 5 3 11 9 12 10 6 7 8

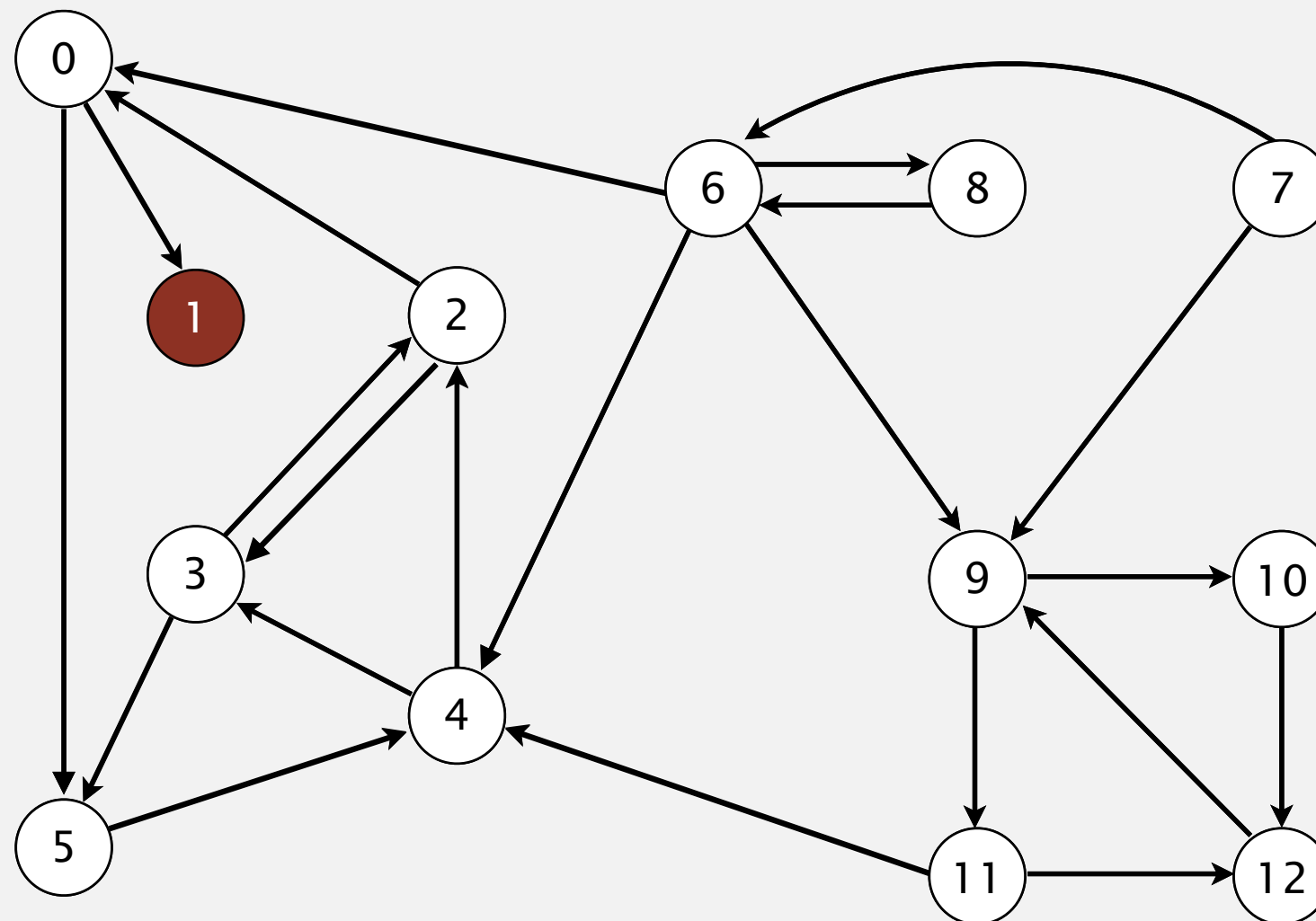


| v | $scc[v]$ |
|-----|----------|
| 0 | - |
| 1 | ① |
| 2 | - |
| 3 | - |
| 4 | - |
| 5 | - |
| 6 | - |
| 7 | - |
| 8 | - |
| 9 | - |
| 10 | - |
| 11 | - |
| 12 | - |

visit 1

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 0 2 4 5 3 11 9 12 10 6 7 8

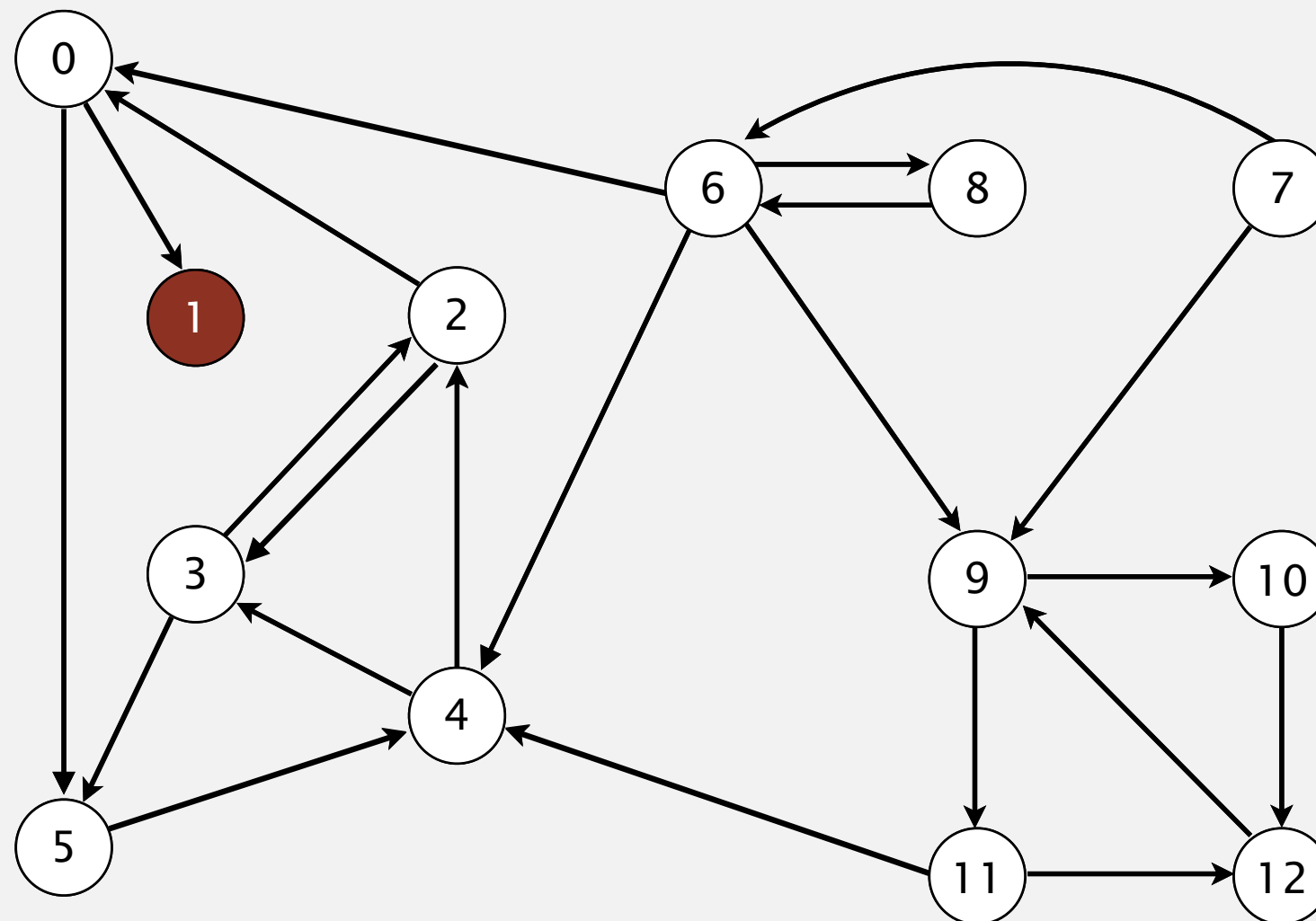


1 done

| v | scc[v] |
|----------|---------------|
| 0 | - |
| 1 | 0 |
| 2 | - |
| 3 | - |
| 4 | - |
| 5 | - |
| 6 | - |
| 7 | - |
| 8 | - |
| 9 | - |
| 10 | - |
| 11 | - |
| 12 | - |

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 0 2 4 5 3 11 9 12 10 6 7 8

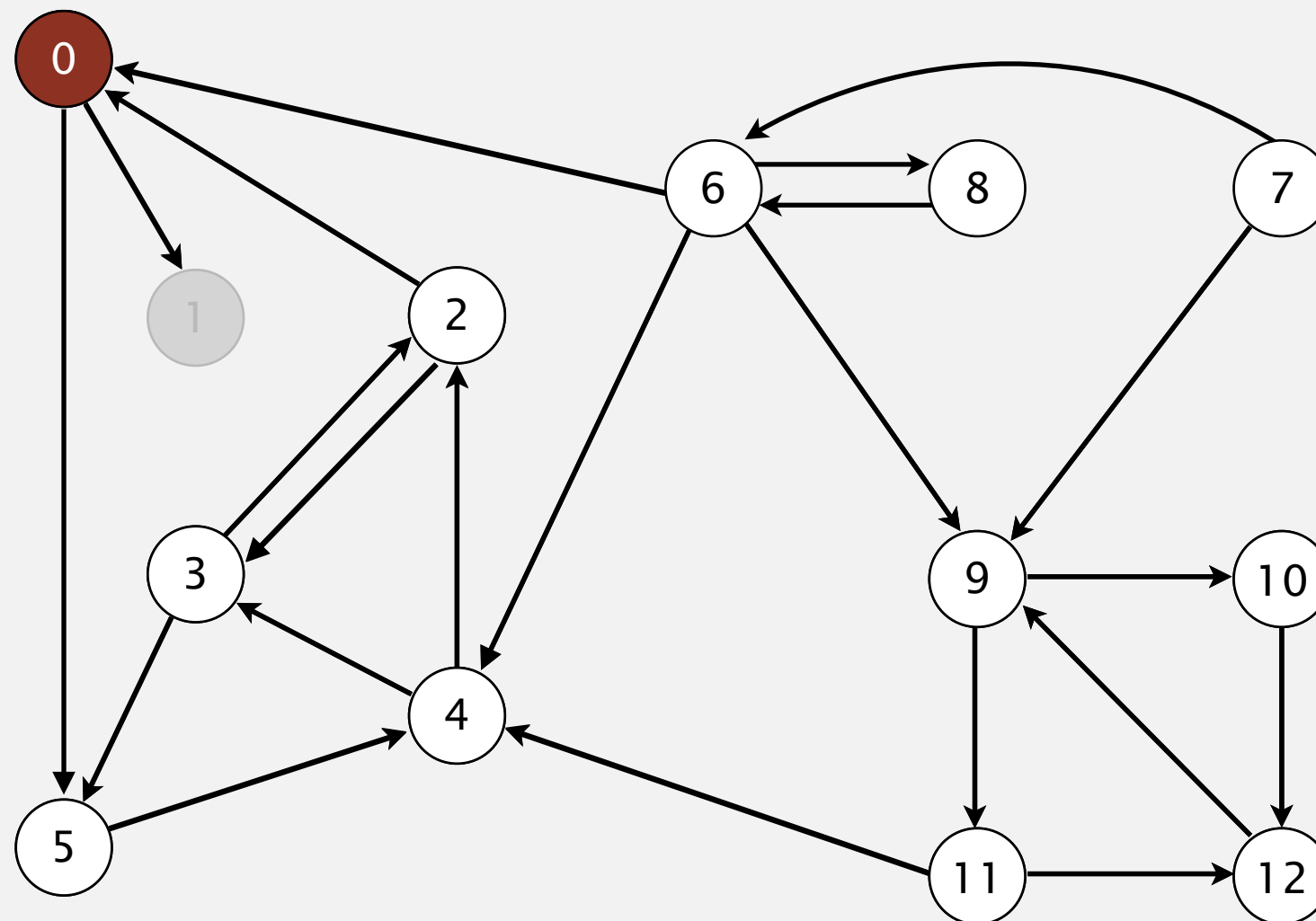


strong component: 1

| v | scc[v] |
|----------|---------------|
| 0 | - |
| 1 | 0 |
| 2 | - |
| 3 | - |
| 4 | - |
| 5 | - |
| 6 | - |
| 7 | - |
| 8 | - |
| 9 | - |
| 10 | - |
| 11 | - |
| 12 | - |

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 **0** 2 4 5 3 11 9 12 10 6 7 8

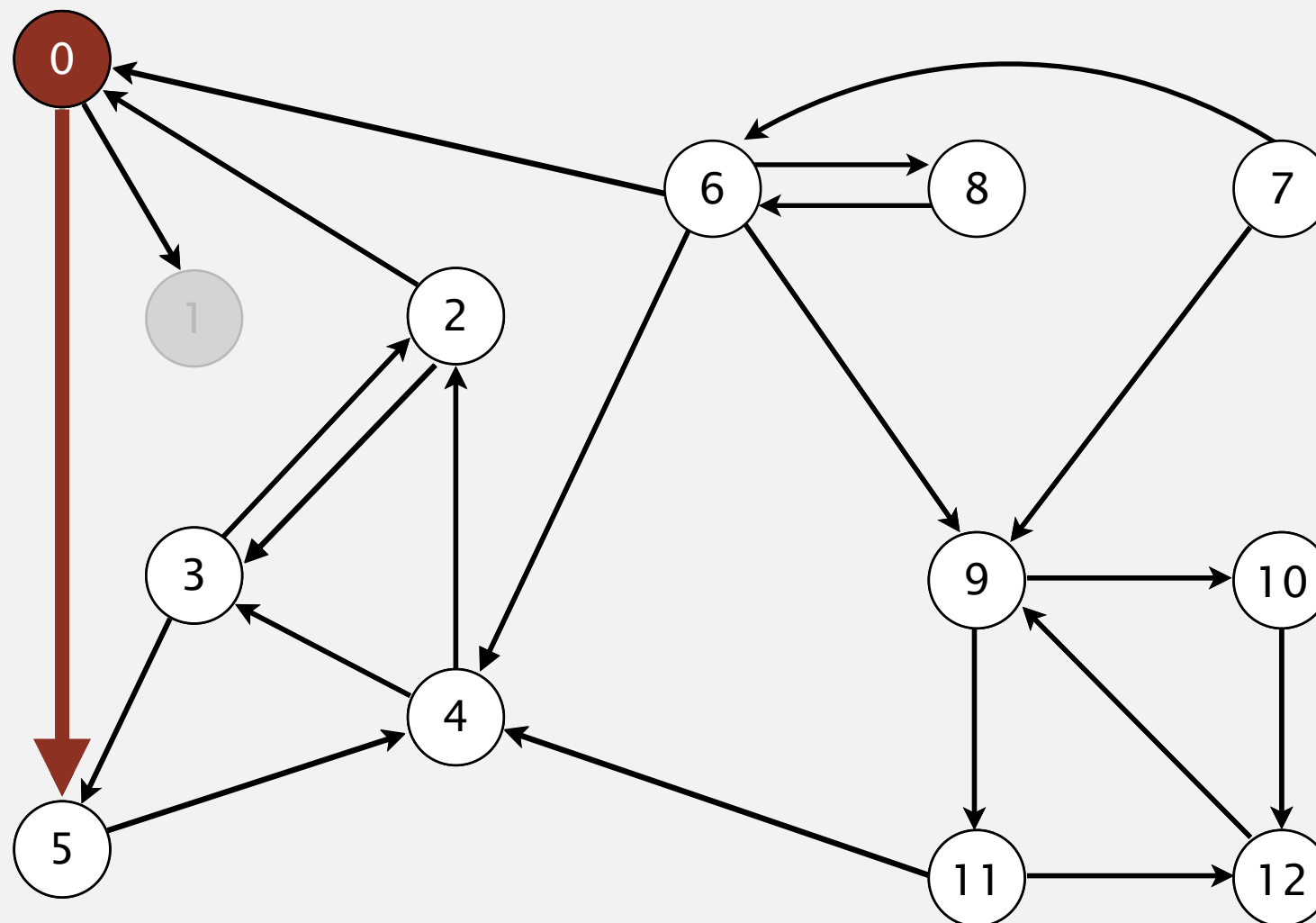


visit 0

| v | scc[v] |
|----|----------|
| 0 | 1 |
| 1 | 0 |
| 2 | - |
| 3 | - |
| 4 | - |
| 5 | - |
| 6 | - |
| 7 | - |
| 8 | - |
| 9 | - |
| 10 | - |
| 11 | - |
| 12 | - |

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 **0** 2 4 5 3 11 9 12 10 6 7 8

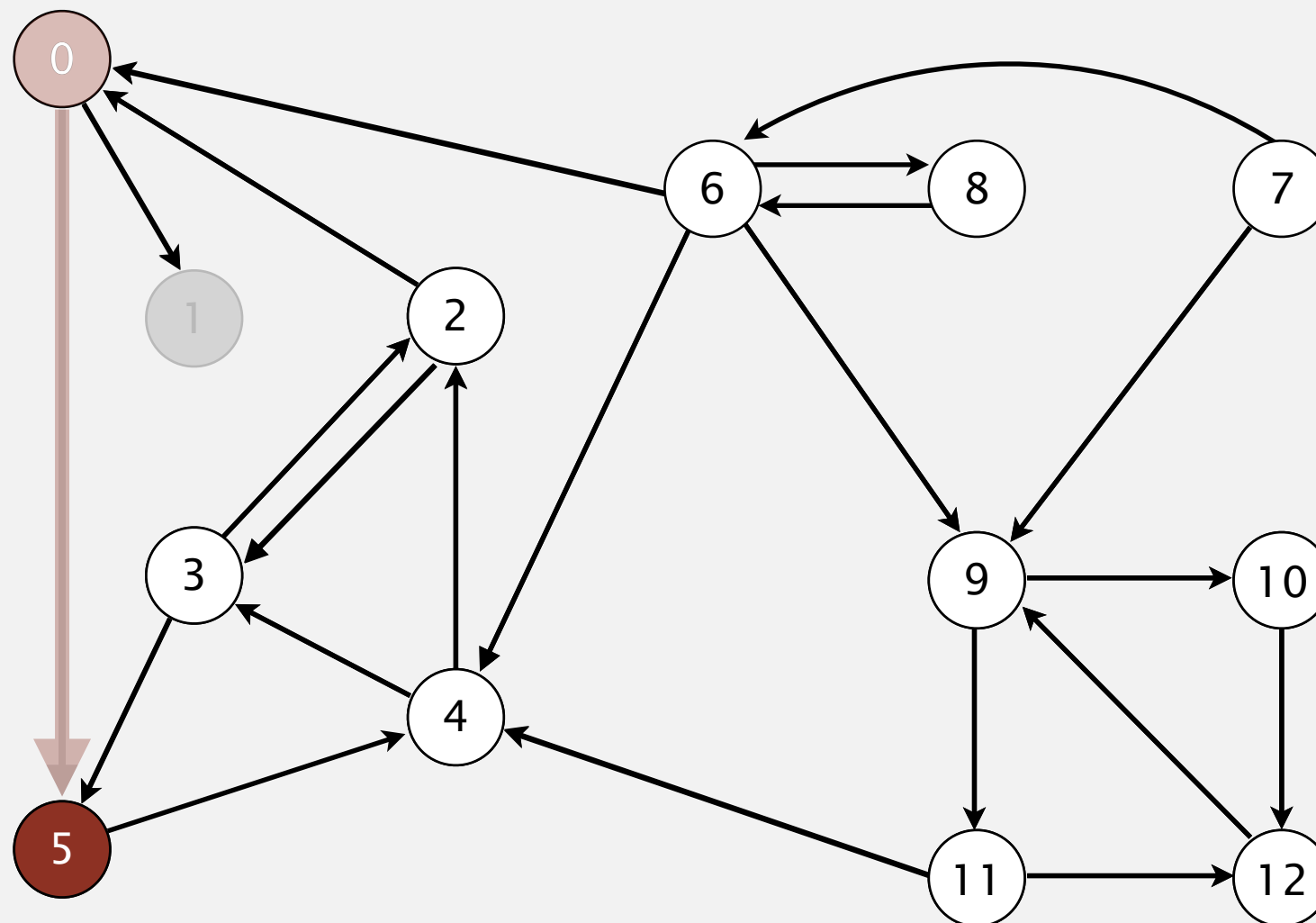


visit 0

| v | scc[v] |
|----|----------|
| 0 | 1 |
| 1 | 0 |
| 2 | - |
| 3 | - |
| 4 | - |
| 5 | - |
| 6 | - |
| 7 | - |
| 8 | - |
| 9 | - |
| 10 | - |
| 11 | - |
| 12 | - |

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 **0** 2 4 5 3 11 9 12 10 6 7 8

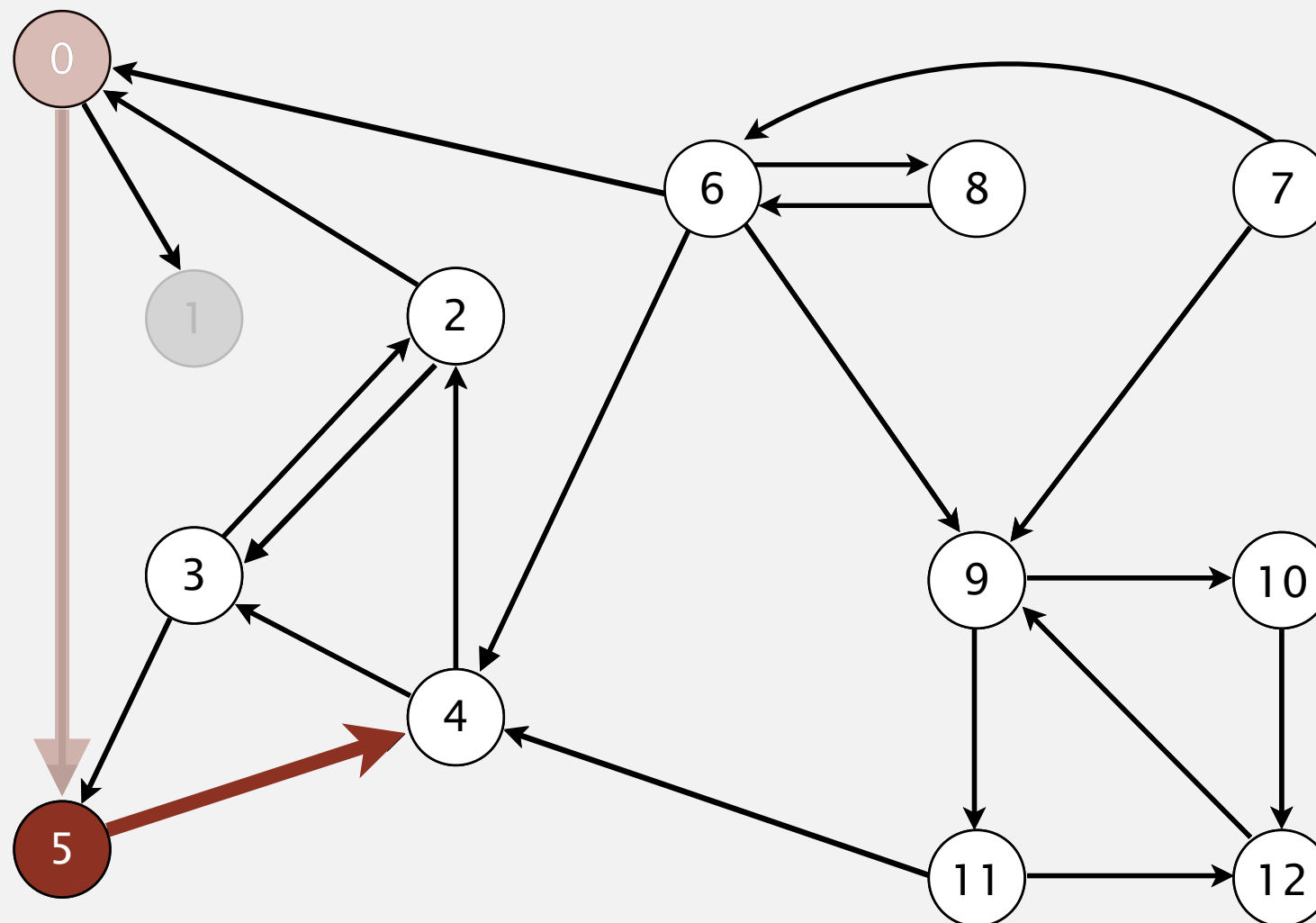


visit 5

| v | scc[v] |
|----|--------|
| 0 | 1 |
| 1 | 0 |
| 2 | - |
| 3 | - |
| 4 | - |
| 5 | 1 |
| 6 | - |
| 7 | - |
| 8 | - |
| 9 | - |
| 10 | - |
| 11 | - |
| 12 | - |

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 **0** 2 4 5 3 11 9 12 10 6 7 8

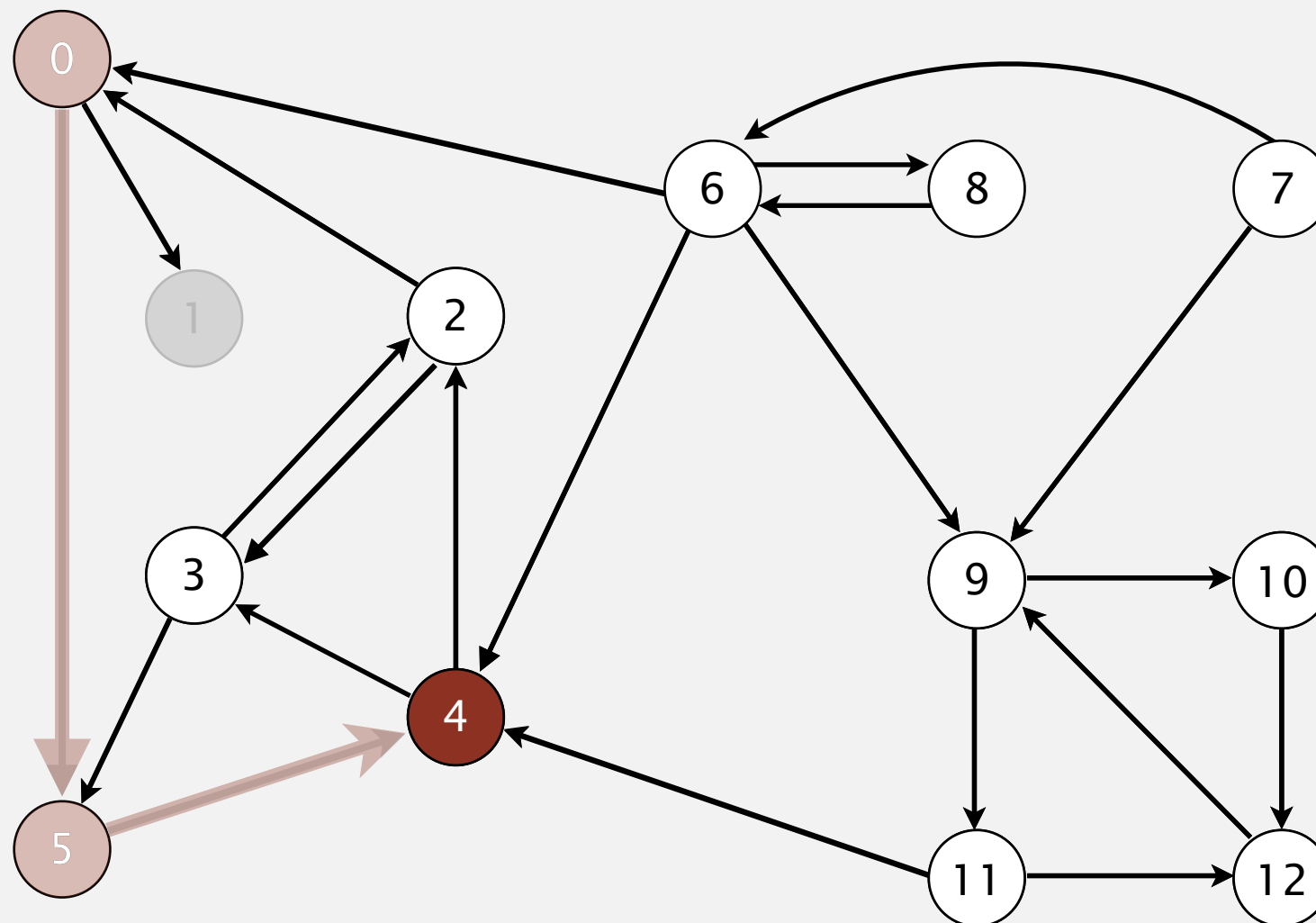


visit 5

| v | scc[v] |
|----|--------|
| 0 | 1 |
| 1 | 0 |
| 2 | - |
| 3 | - |
| 4 | - |
| 5 | 1 |
| 6 | - |
| 7 | - |
| 8 | - |
| 9 | - |
| 10 | - |
| 11 | - |
| 12 | - |

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 **0** 2 4 5 3 11 9 12 10 6 7 8

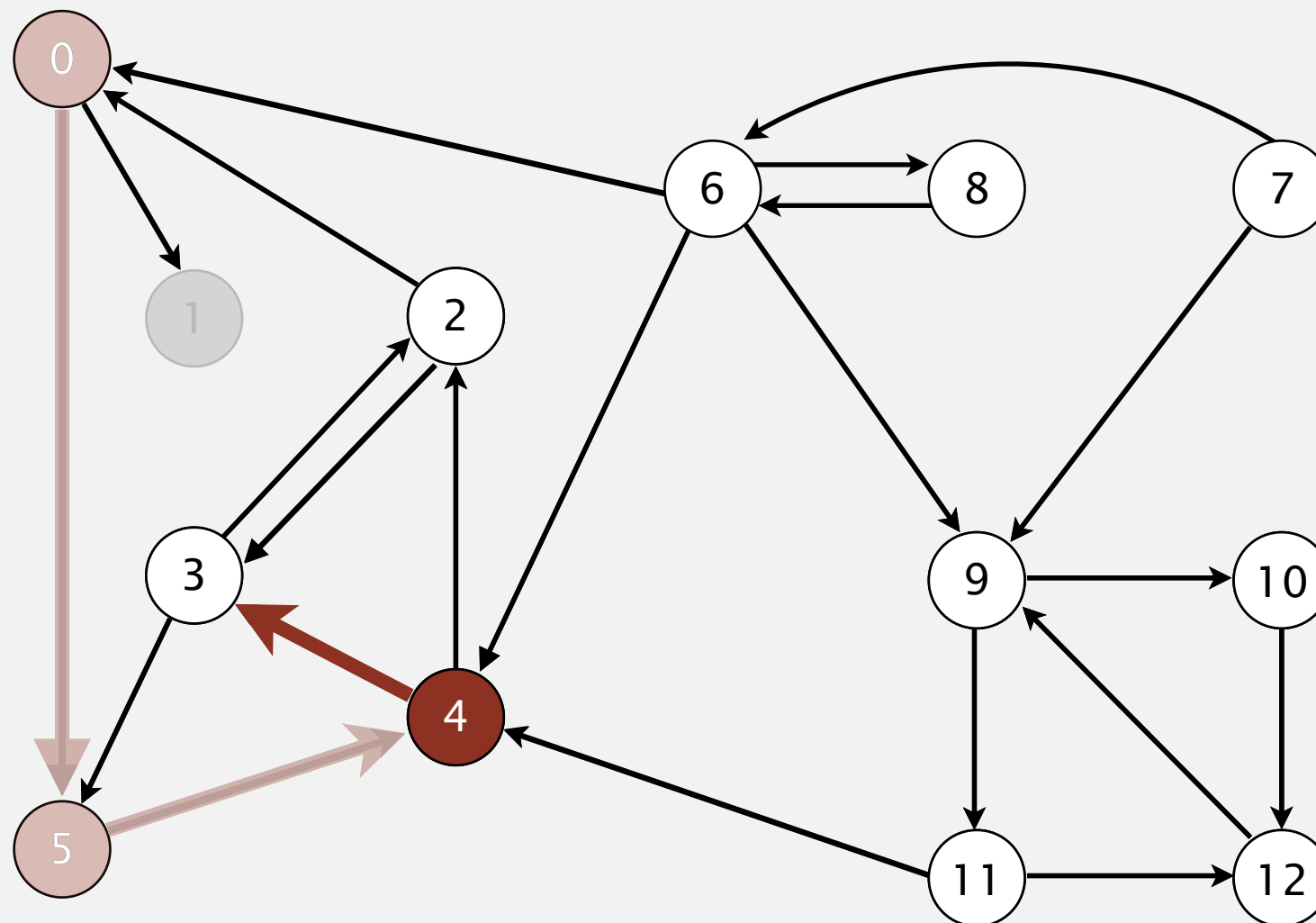


visit 4

| v | $scc[v]$ |
|-----|----------|
| 0 | 1 |
| 1 | 0 |
| 2 | - |
| 3 | - |
| 4 | 1 |
| 5 | 1 |
| 6 | - |
| 7 | - |
| 8 | - |
| 9 | - |
| 10 | - |
| 11 | - |
| 12 | - |

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 **0** 2 4 5 3 11 9 12 10 6 7 8

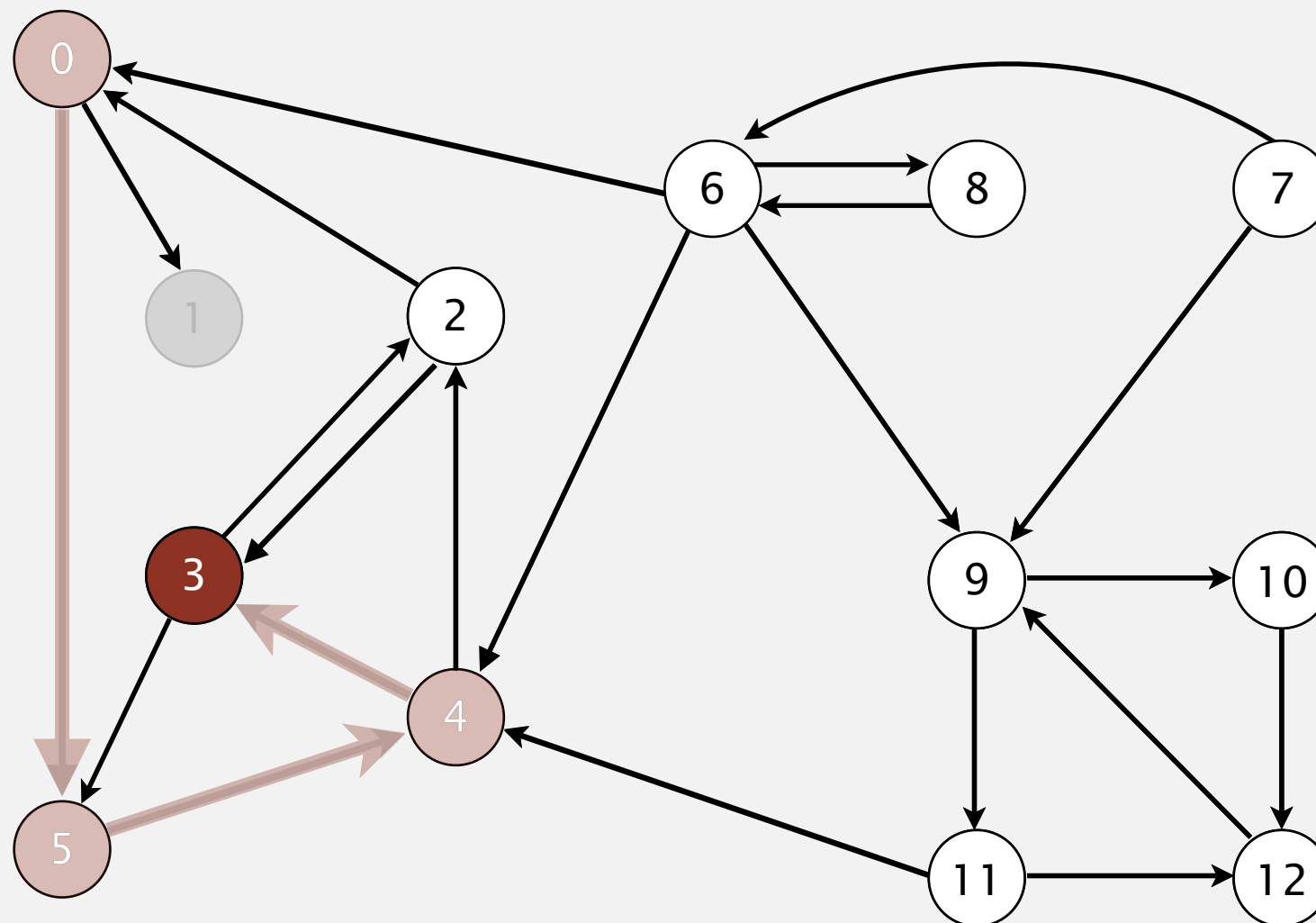


visit 4

| v | $scc[v]$ |
|-----|----------|
| 0 | 1 |
| 1 | 0 |
| 2 | - |
| 3 | - |
| 4 | 1 |
| 5 | 1 |
| 6 | - |
| 7 | - |
| 8 | - |
| 9 | - |
| 10 | - |
| 11 | - |
| 12 | - |

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 **0** 2 4 5 3 11 9 12 10 6 7 8

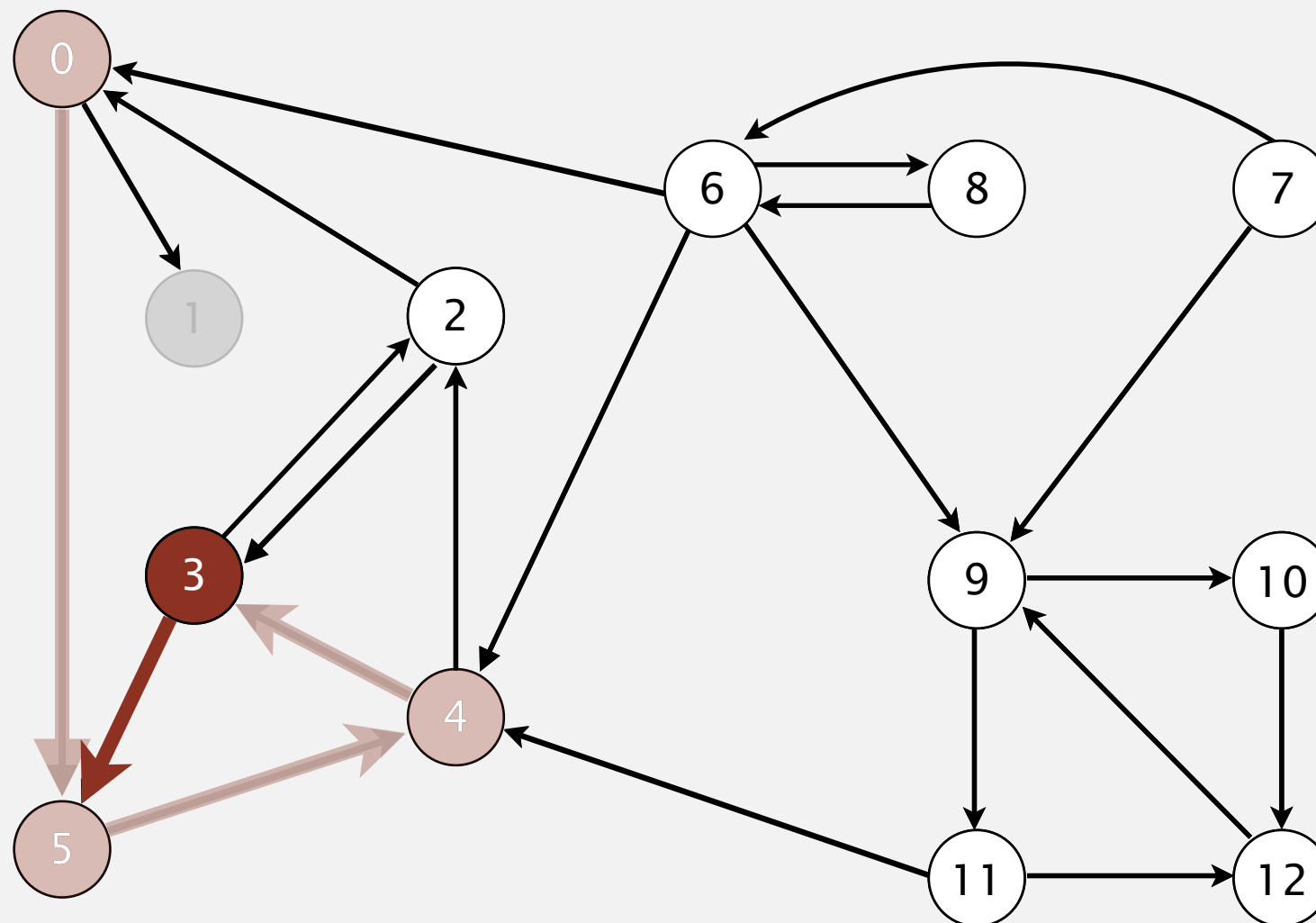


visit 3

| v | scc[v] |
|----|--------|
| 0 | 1 |
| 1 | 0 |
| 2 | |
| 3 | |
| 4 | 1 |
| 5 | 1 |
| 6 | - |
| 7 | - |
| 8 | - |
| 9 | - |
| 10 | - |
| 11 | - |
| 12 | - |

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 **0** 2 4 5 3 11 9 12 10 6 7 8

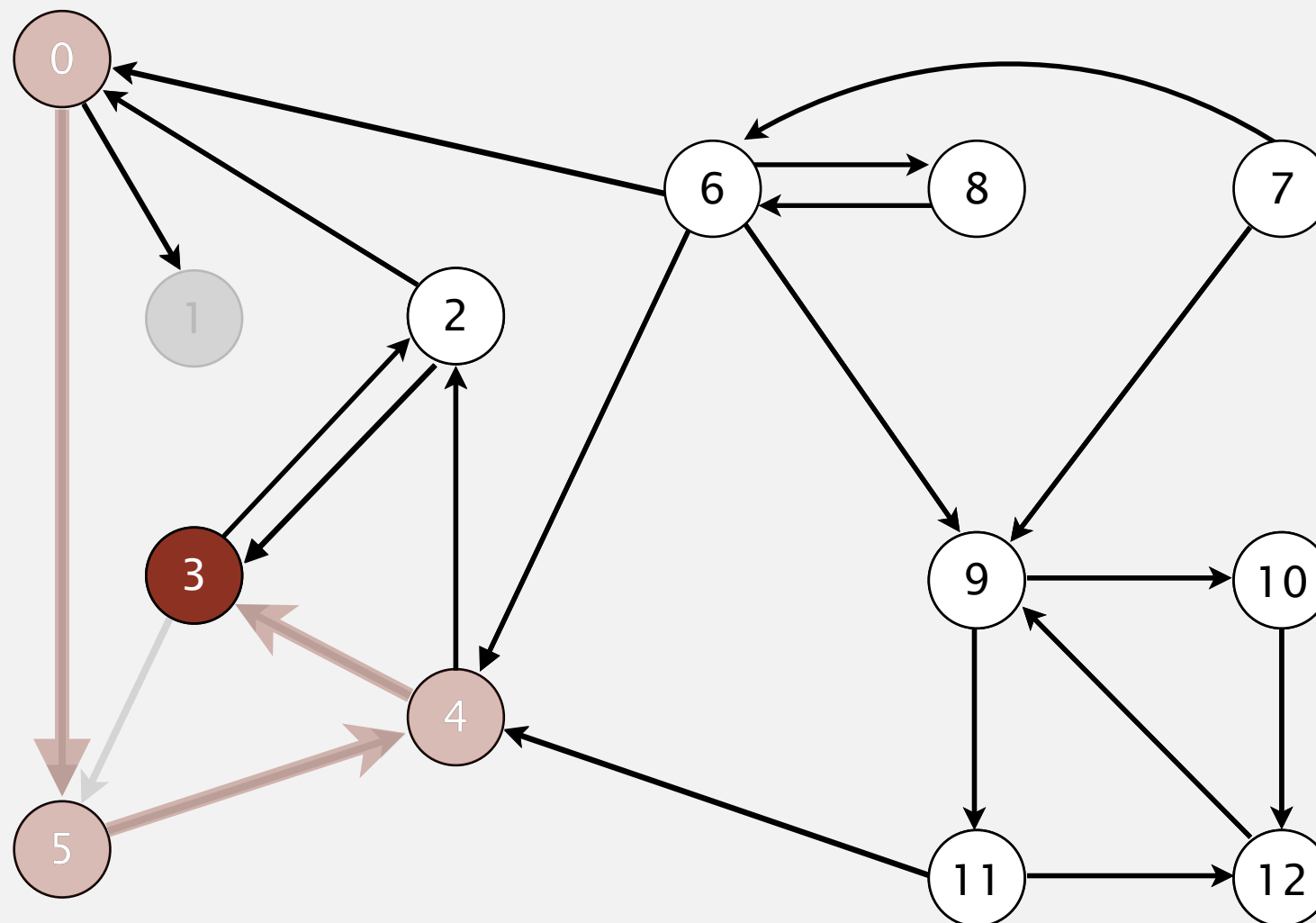


visit 3

| v | scc[v] |
|----|--------|
| 0 | 1 |
| 1 | 0 |
| 2 | |
| 3 | |
| 4 | 1 |
| 5 | 1 |
| 6 | - |
| 7 | - |
| 8 | - |
| 9 | - |
| 10 | - |
| 11 | - |
| 12 | - |

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 **0** 2 4 5 3 11 9 12 10 6 7 8

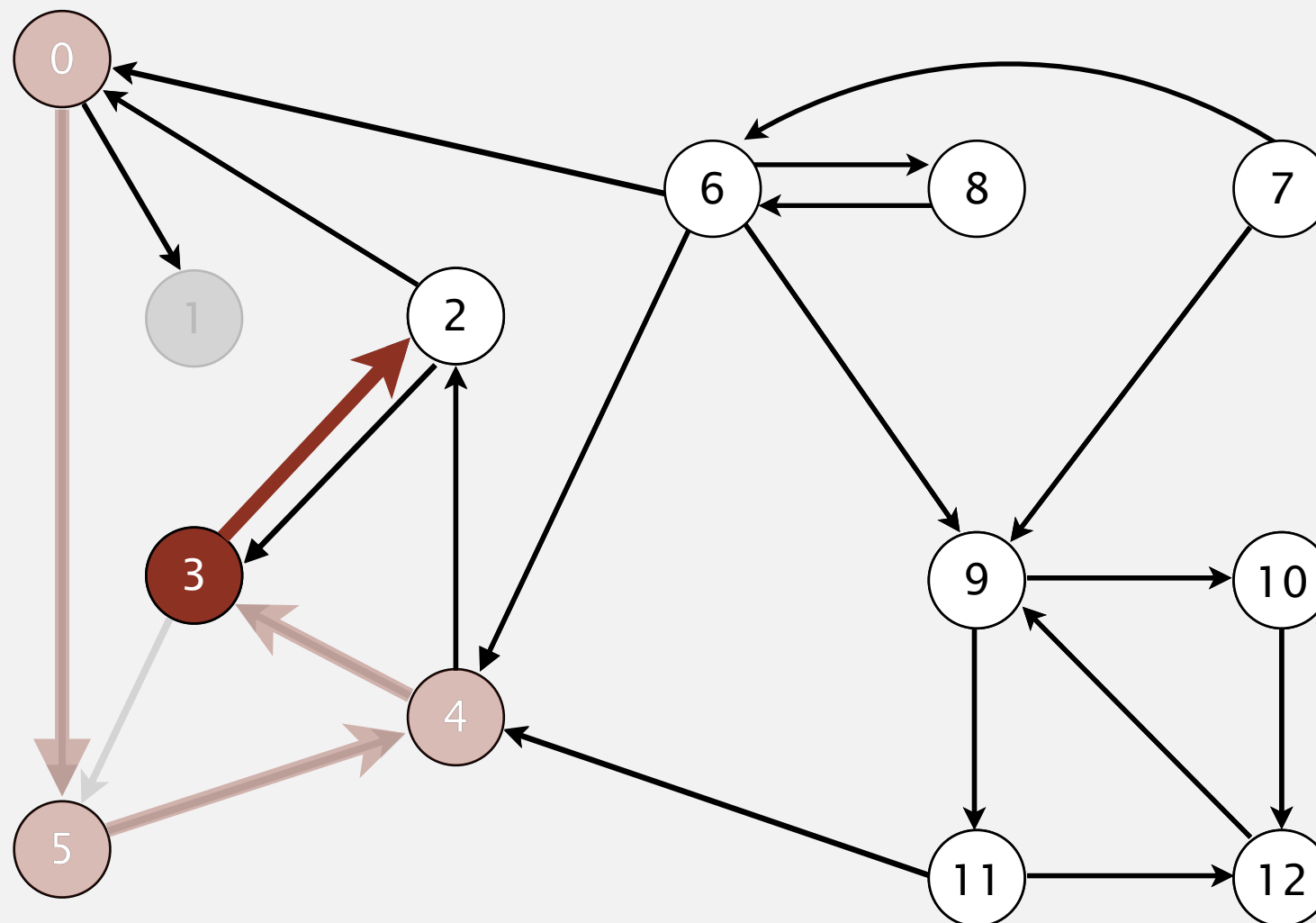


visit 3

| v | $scc[v]$ |
|-----|----------|
| 0 | 1 |
| 1 | 0 |
| 2 | - |
| 3 | 1 |
| 4 | 1 |
| 5 | 1 |
| 6 | - |
| 7 | - |
| 8 | - |
| 9 | - |
| 10 | - |
| 11 | - |
| 12 | - |

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 **0** 2 4 5 3 11 9 12 10 6 7 8

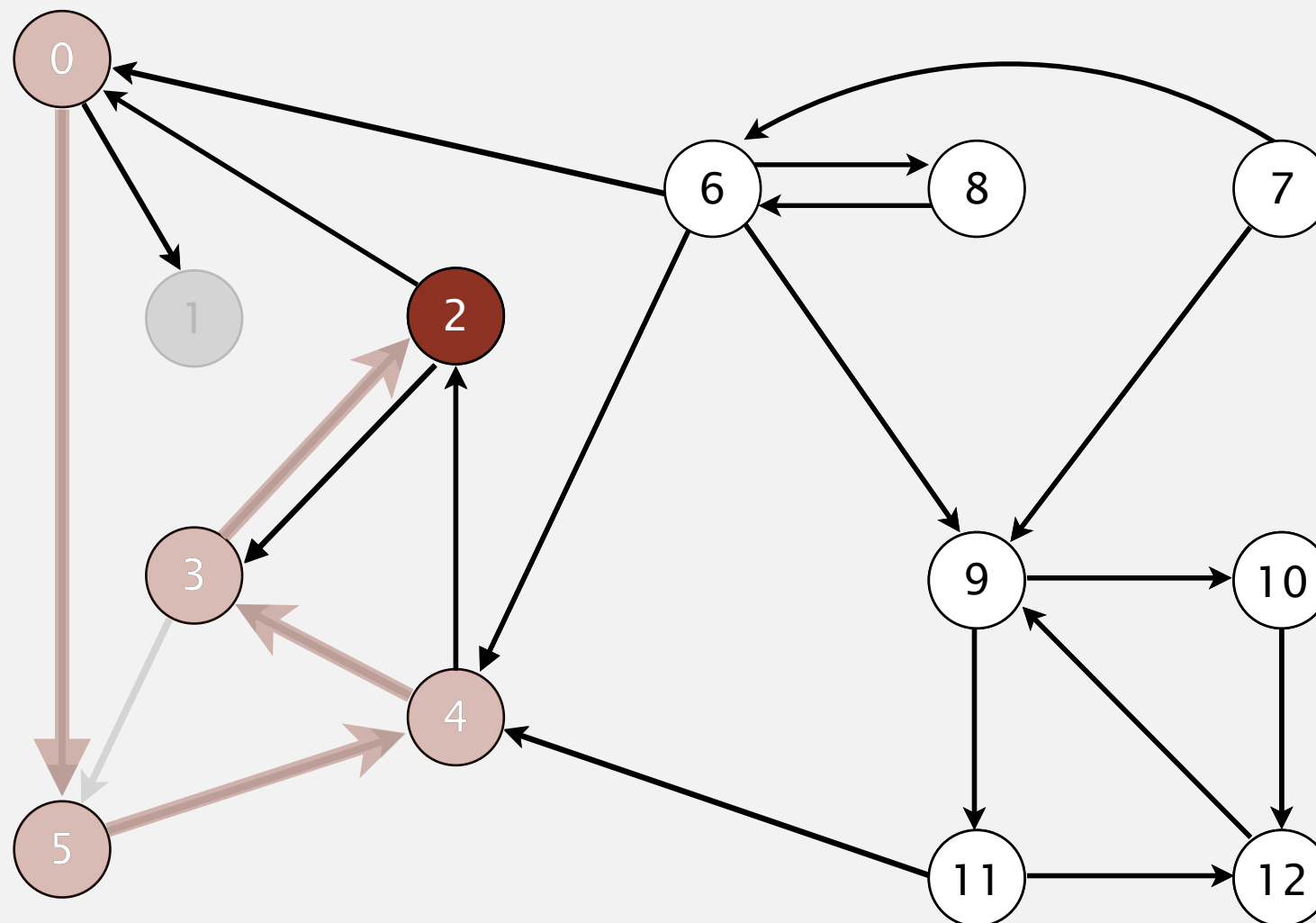


visit 3

| v | scc[v] |
|----|--------|
| 0 | 1 |
| 1 | 0 |
| 2 | - |
| 3 | 1 |
| 4 | 1 |
| 5 | 1 |
| 6 | - |
| 7 | - |
| 8 | - |
| 9 | - |
| 10 | - |
| 11 | - |
| 12 | - |

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 **0** 2 4 5 3 11 9 12 10 6 7 8

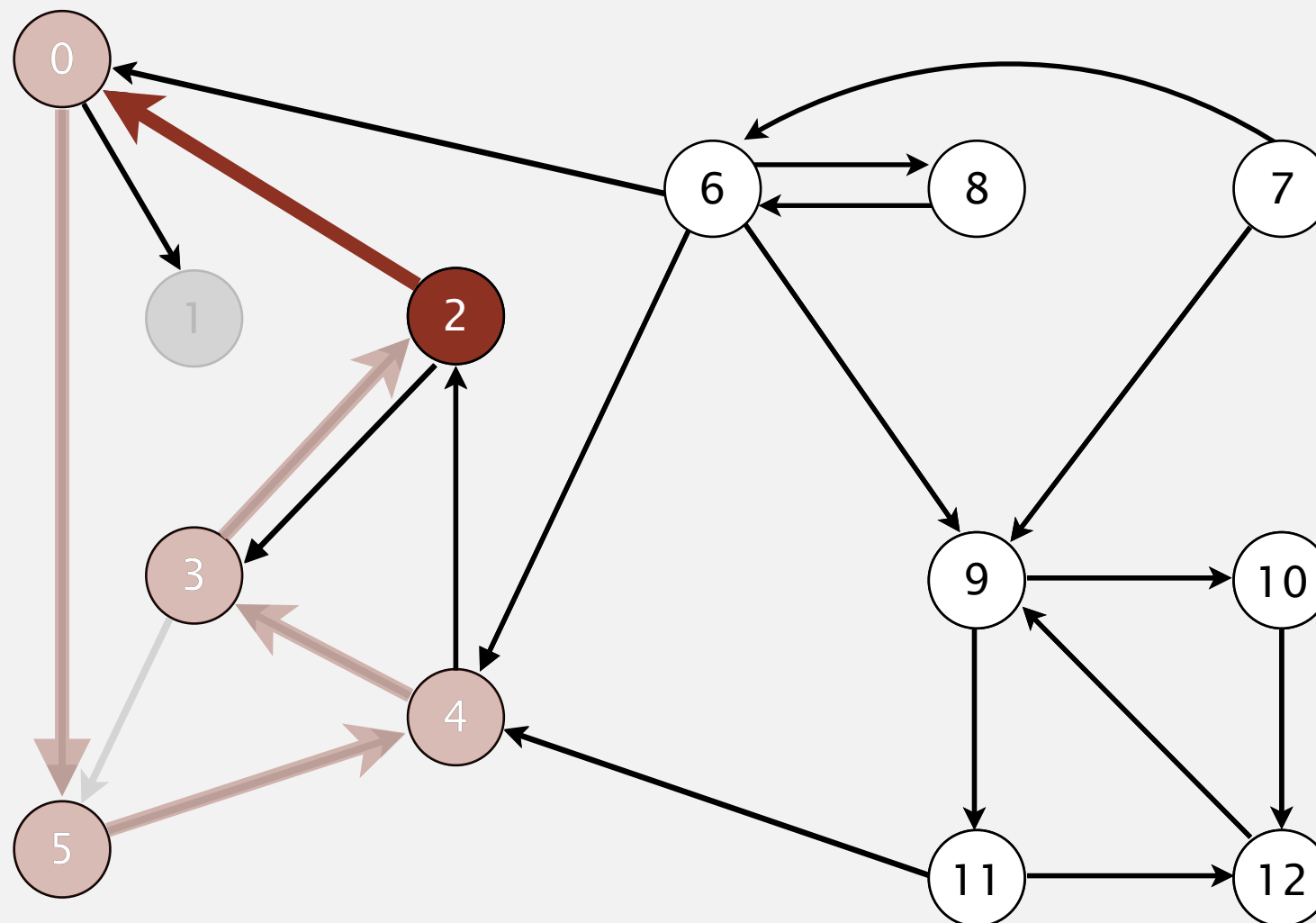


visit 2

| v | scc[v] |
|----|--------|
| 0 | 1 |
| 1 | 0 |
| 2 | 1 |
| 3 | 1 |
| 4 | 1 |
| 5 | 1 |
| 6 | - |
| 7 | - |
| 8 | - |
| 9 | - |
| 10 | - |
| 11 | - |
| 12 | - |

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 **0** 2 4 5 3 11 9 12 10 6 7 8

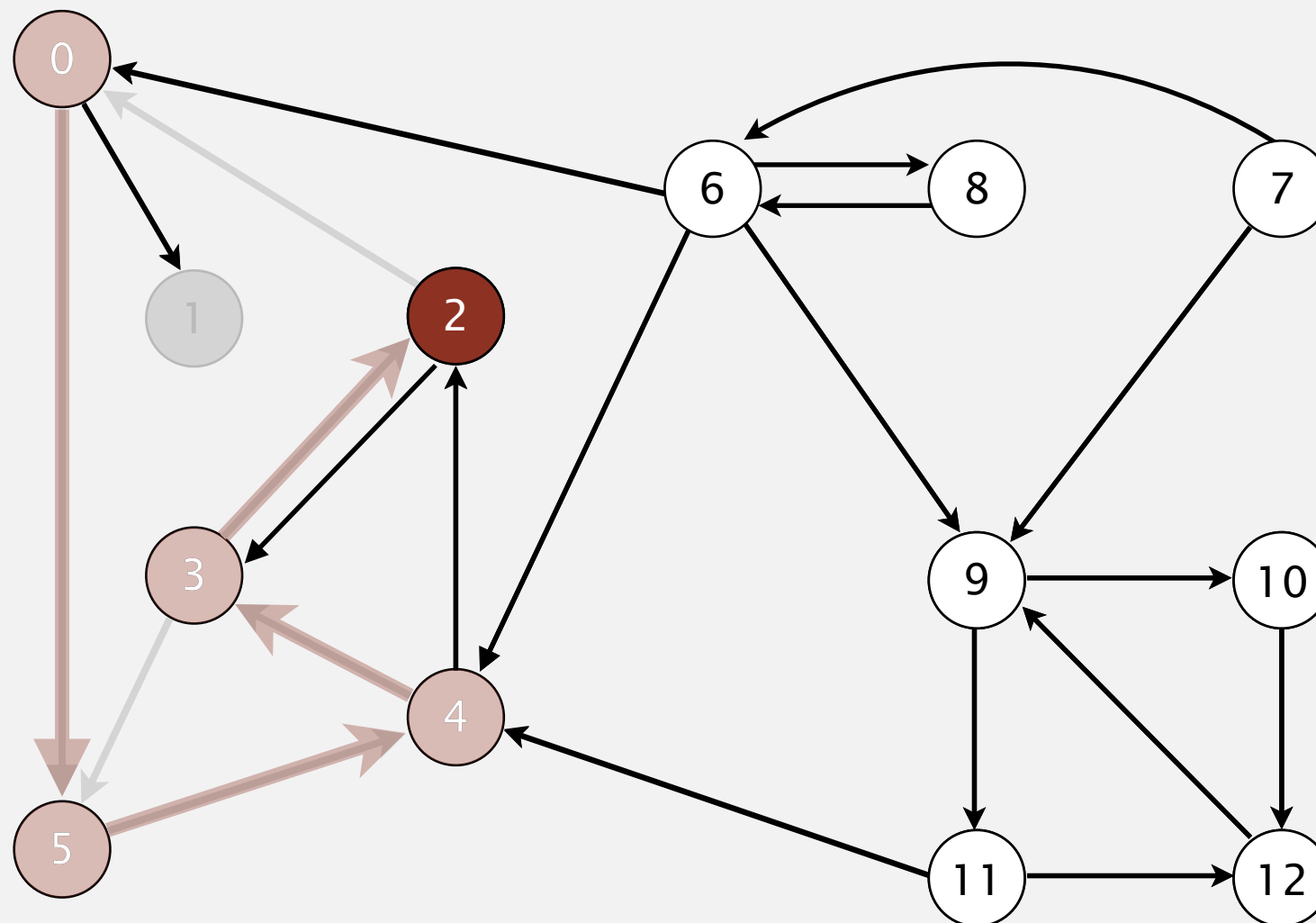


visit 2

| v | scc[v] |
|----------|---------------|
| 0 | 1 |
| 1 | 0 |
| 2 | 1 |
| 3 | 1 |
| 4 | 1 |
| 5 | 1 |
| 6 | - |
| 7 | - |
| 8 | - |
| 9 | - |
| 10 | - |
| 11 | - |
| 12 | - |

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 **0** 2 4 5 3 11 9 12 10 6 7 8

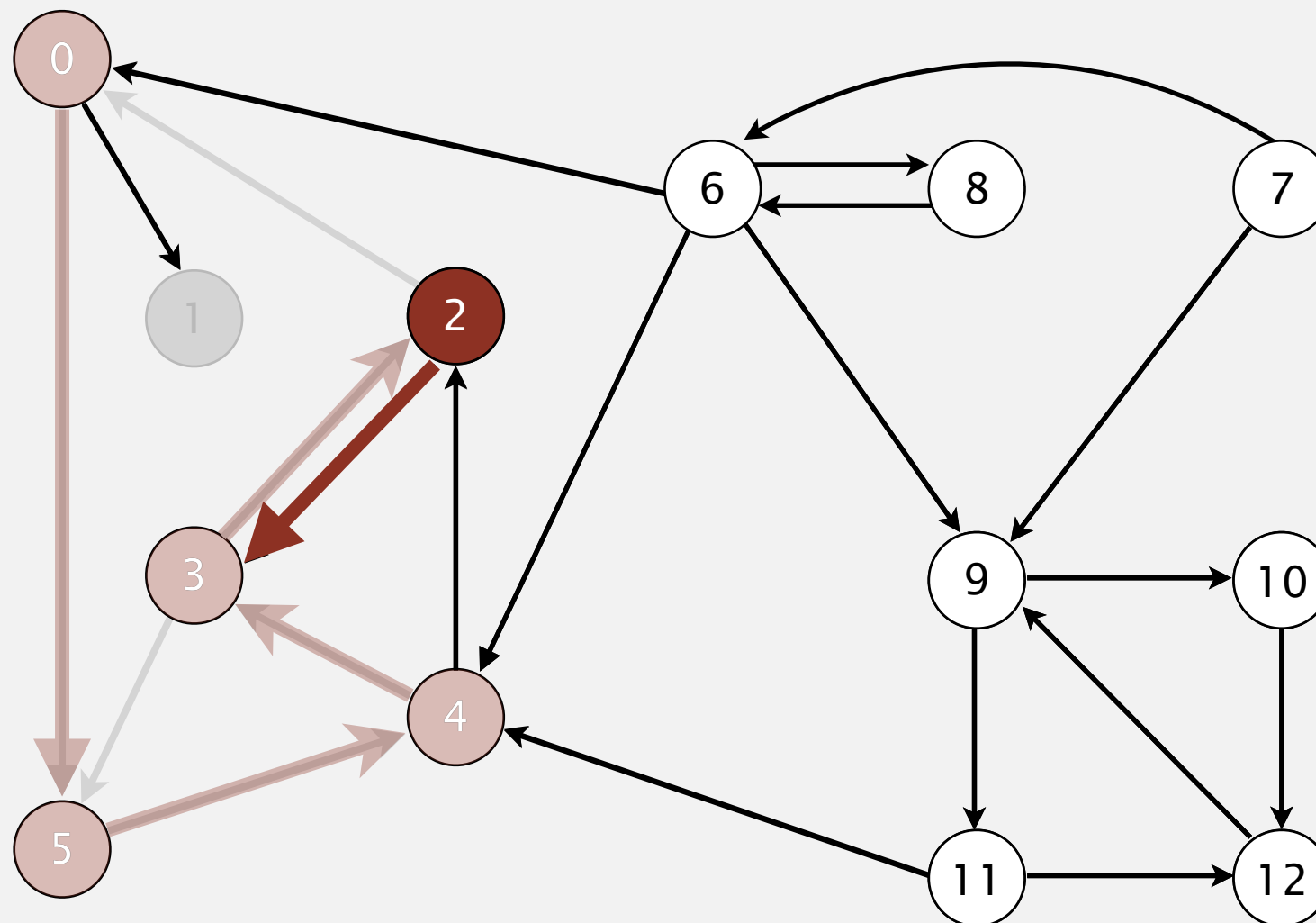


visit 2

| v | $scc[v]$ |
|-----|----------|
| 0 | 1 |
| 1 | 0 |
| 2 | 1 |
| 3 | 1 |
| 4 | 1 |
| 5 | 1 |
| 6 | - |
| 7 | - |
| 8 | - |
| 9 | - |
| 10 | - |
| 11 | - |
| 12 | - |

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 **0** 2 4 5 3 11 9 12 10 6 7 8

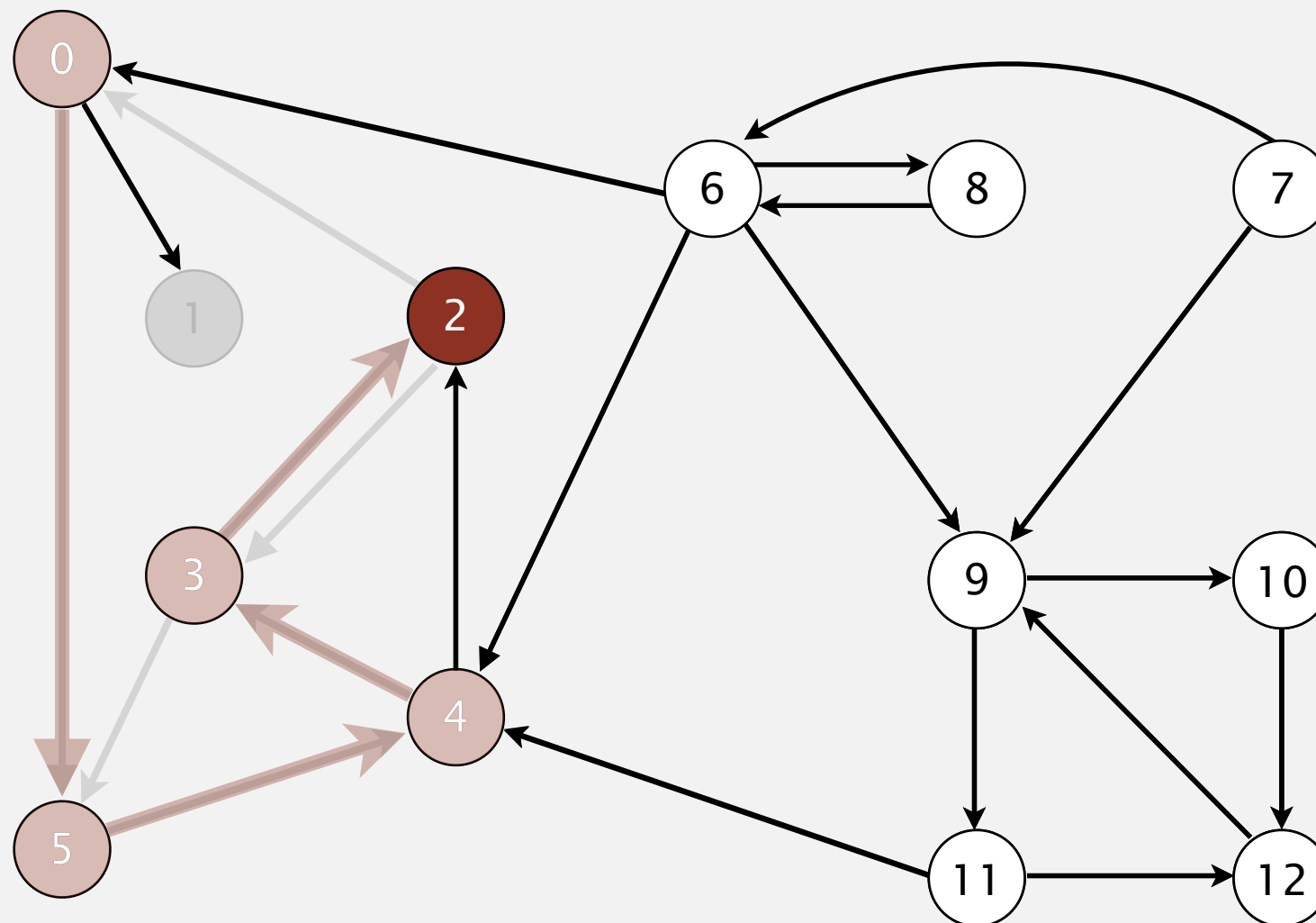


visit 2

| v | scc[v] |
|----|--------|
| 0 | 1 |
| 1 | 0 |
| 2 | 1 |
| 3 | 1 |
| 4 | 1 |
| 5 | 1 |
| 6 | - |
| 7 | - |
| 8 | - |
| 9 | - |
| 10 | - |
| 11 | - |
| 12 | - |

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 **0** 2 4 5 3 11 9 12 10 6 7 8

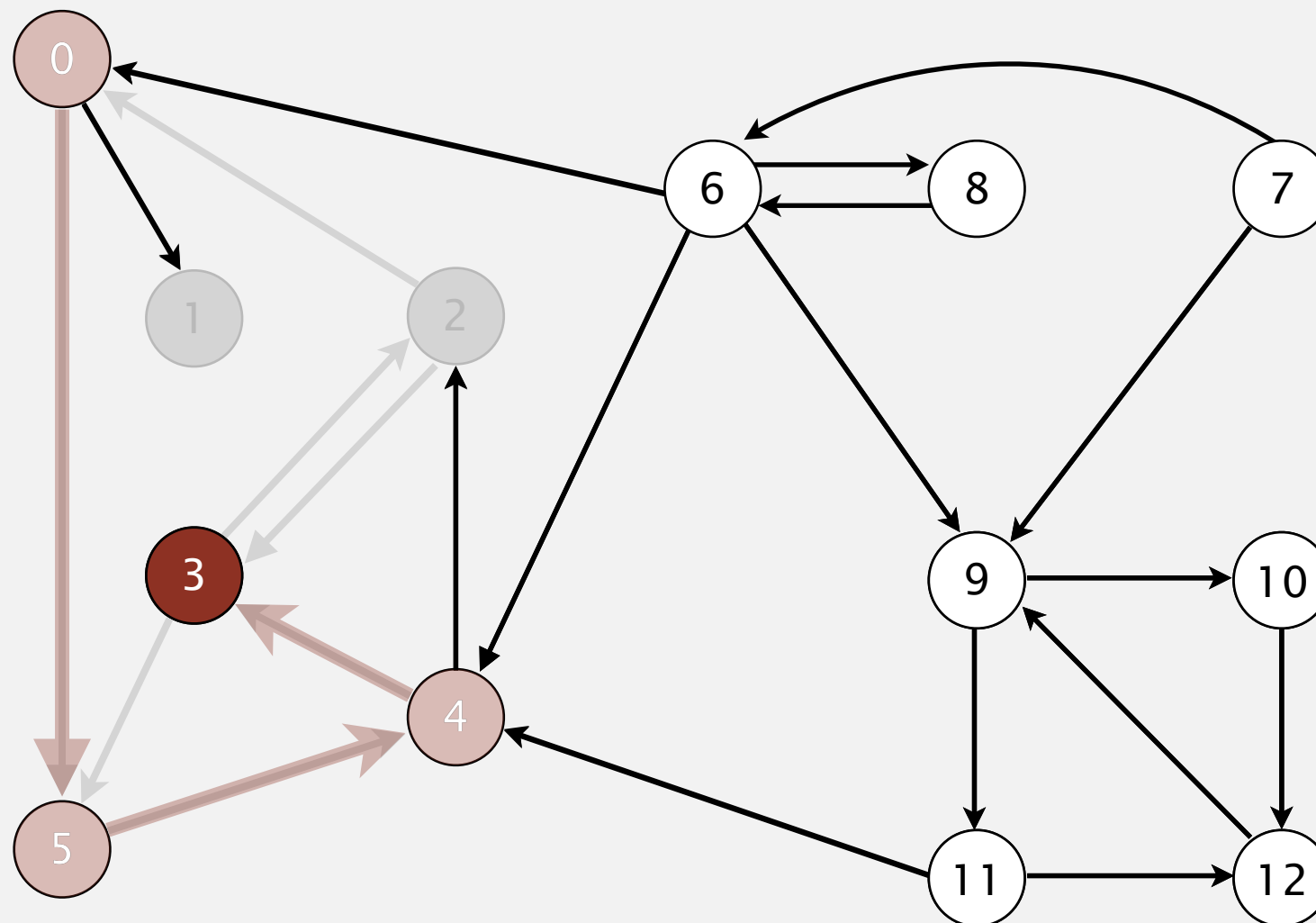


2 done

| v | scc[v] |
|----------|---------------|
| 0 | 1 |
| 1 | 0 |
| 2 | 1 |
| 3 | 1 |
| 4 | 1 |
| 5 | 1 |
| 6 | - |
| 7 | - |
| 8 | - |
| 9 | - |
| 10 | - |
| 11 | - |
| 12 | - |

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 **0** 2 4 5 3 11 9 12 10 6 7 8

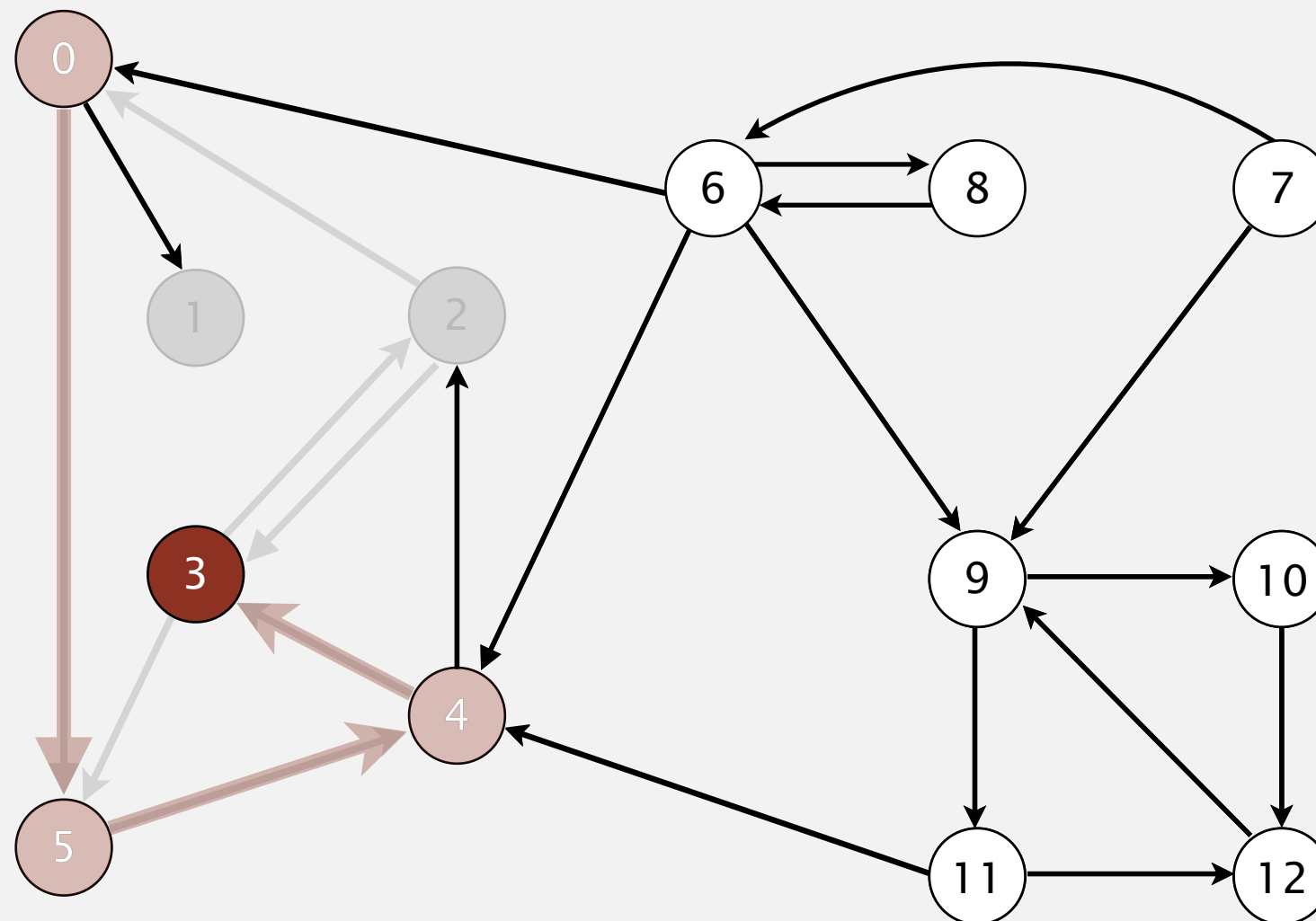


2 done

| v | scc[v] |
|----|--------|
| 0 | 1 |
| 1 | 0 |
| 2 | 1 |
| 3 | 1 |
| 4 | 1 |
| 5 | 1 |
| 6 | - |
| 7 | - |
| 8 | - |
| 9 | - |
| 10 | - |
| 11 | - |
| 12 | - |

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 **0** 2 4 5 3 11 9 12 10 6 7 8

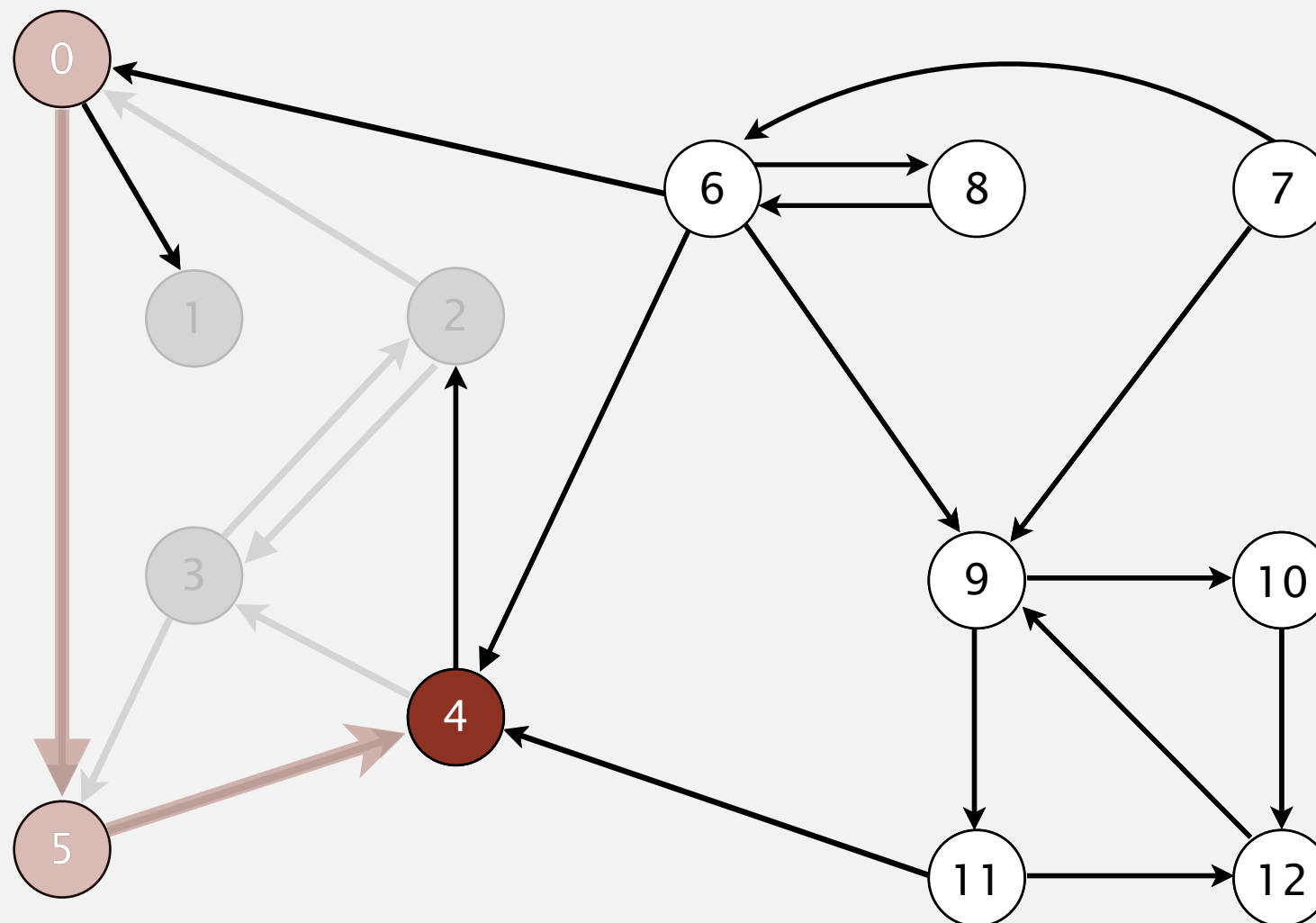


3 done

| v | scc[v] |
|----|--------|
| 0 | 1 |
| 1 | 0 |
| 2 | 1 |
| 3 | 1 |
| 4 | 1 |
| 5 | 1 |
| 6 | - |
| 7 | - |
| 8 | - |
| 9 | - |
| 10 | - |
| 11 | - |
| 12 | - |

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 **0** 2 4 5 3 11 9 12 10 6 7 8

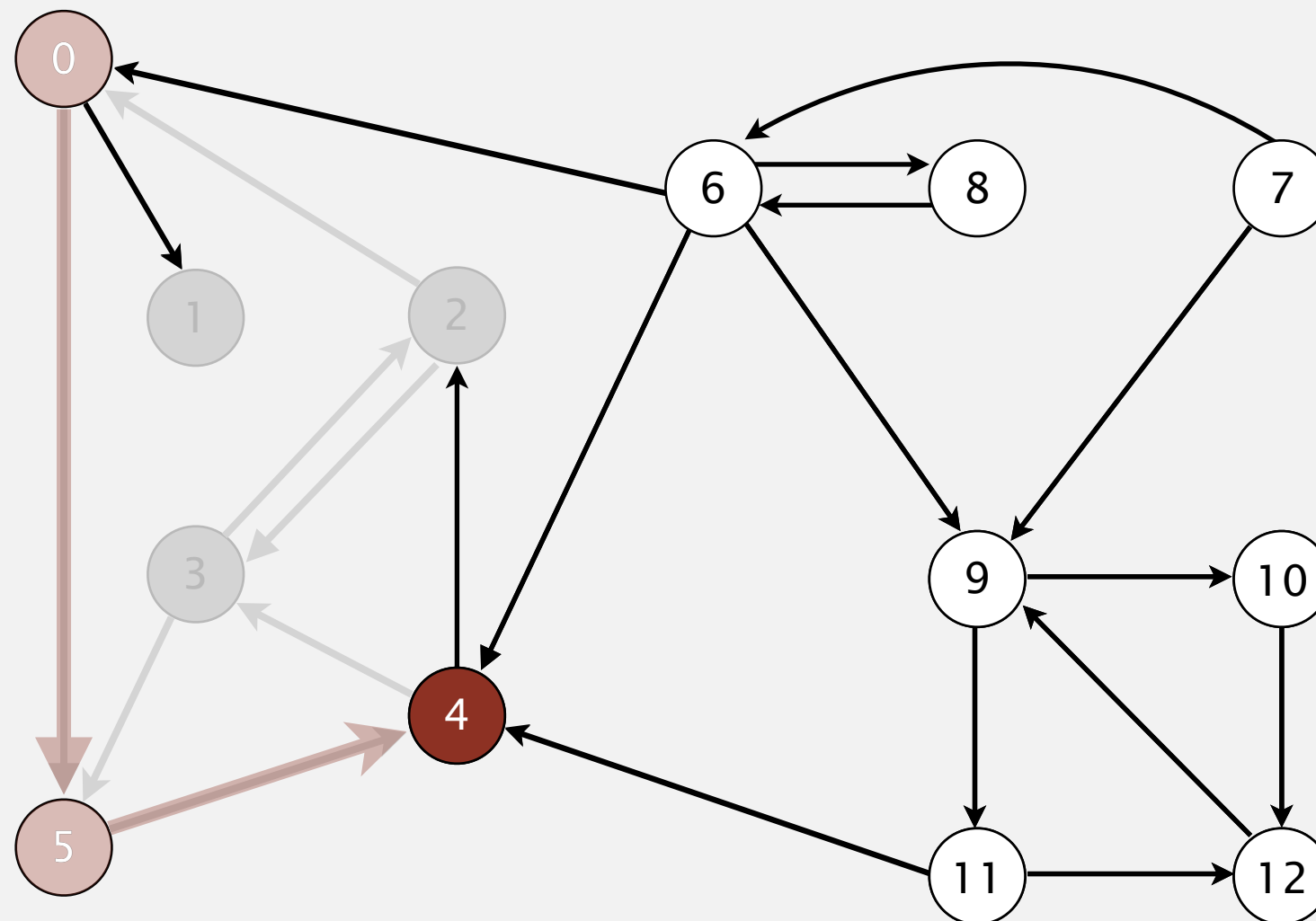


3 done

| v | scc[v] |
|----|--------|
| 0 | 1 |
| 1 | 0 |
| 2 | 1 |
| 3 | 1 |
| 4 | 1 |
| 5 | 1 |
| 6 | - |
| 7 | - |
| 8 | - |
| 9 | - |
| 10 | - |
| 11 | - |
| 12 | - |

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 **0** 2 4 5 3 11 9 12 10 6 7 8

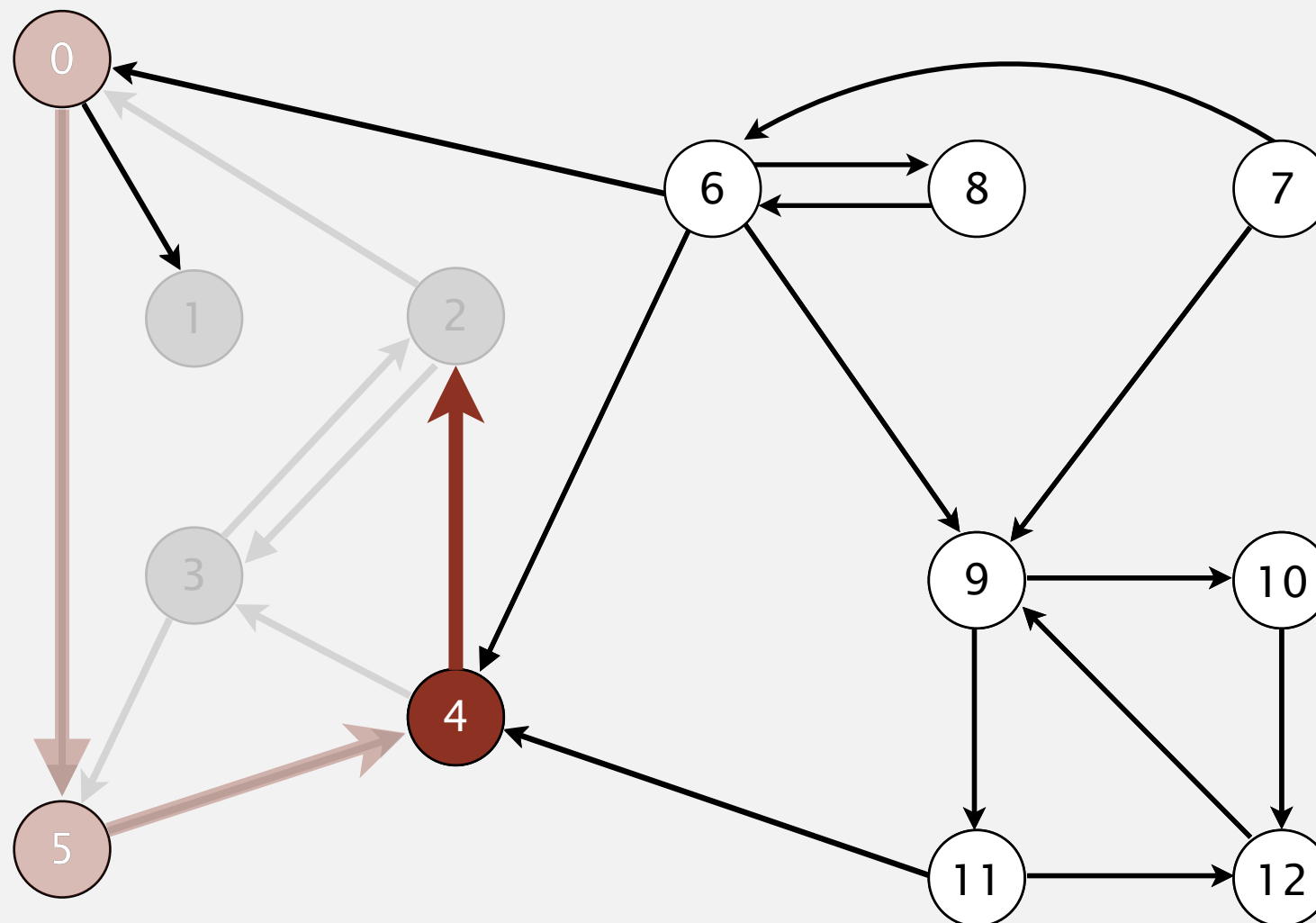


visit 4

| v | scc[v] |
|----|--------|
| 0 | 1 |
| 1 | 0 |
| 2 | 1 |
| 3 | 1 |
| 4 | 1 |
| 5 | 1 |
| 6 | - |
| 7 | - |
| 8 | - |
| 9 | - |
| 10 | - |
| 11 | - |
| 12 | - |

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 **0** 2 4 5 3 11 9 12 10 6 7 8

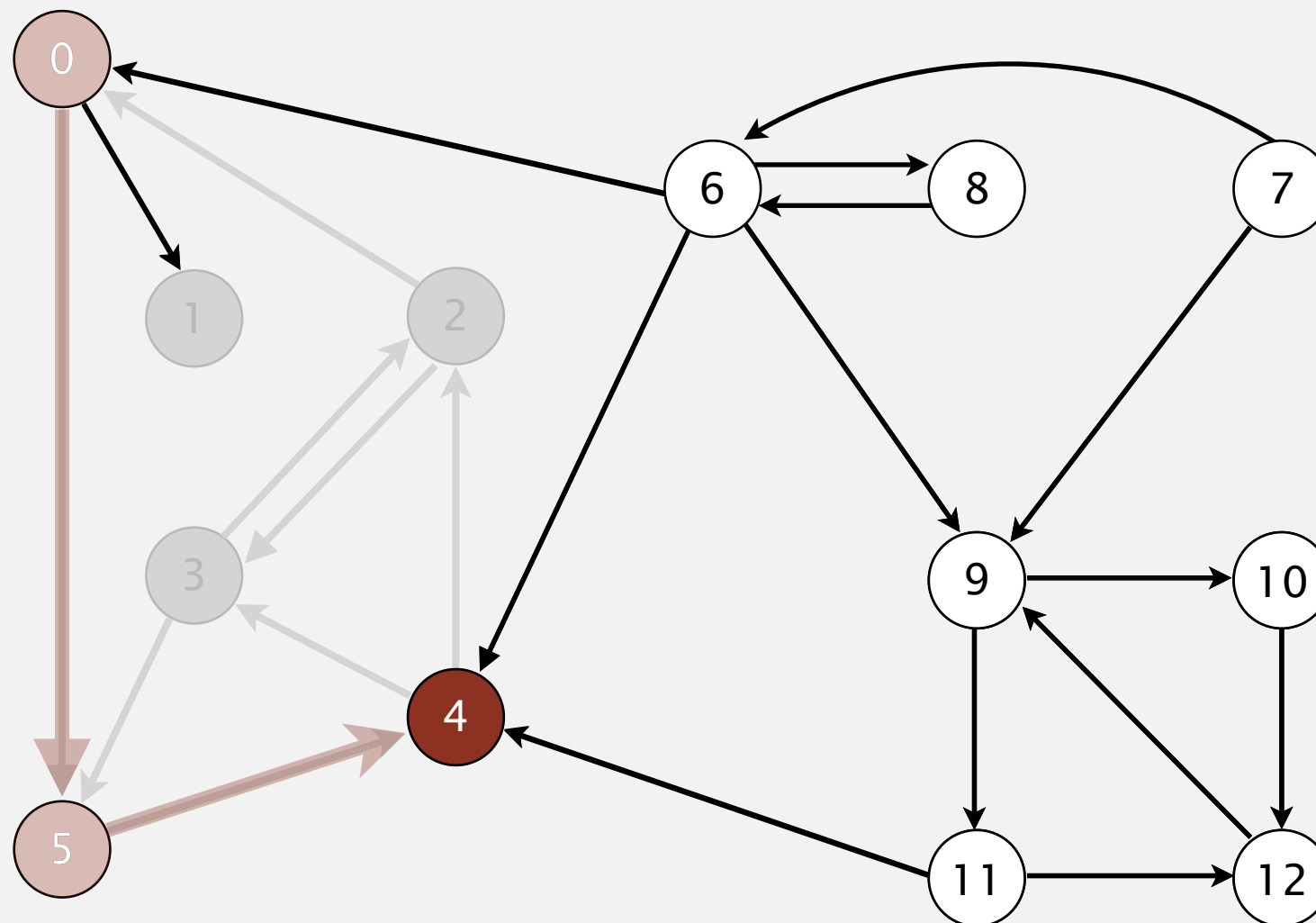


visit 4

| v | $scc[v]$ |
|-----|----------|
| 0 | 1 |
| 1 | 0 |
| 2 | 1 |
| 3 | 1 |
| 4 | 1 |
| 5 | 1 |
| 6 | - |
| 7 | - |
| 8 | - |
| 9 | - |
| 10 | - |
| 11 | - |
| 12 | - |

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 **0** 2 4 5 3 11 9 12 10 6 7 8

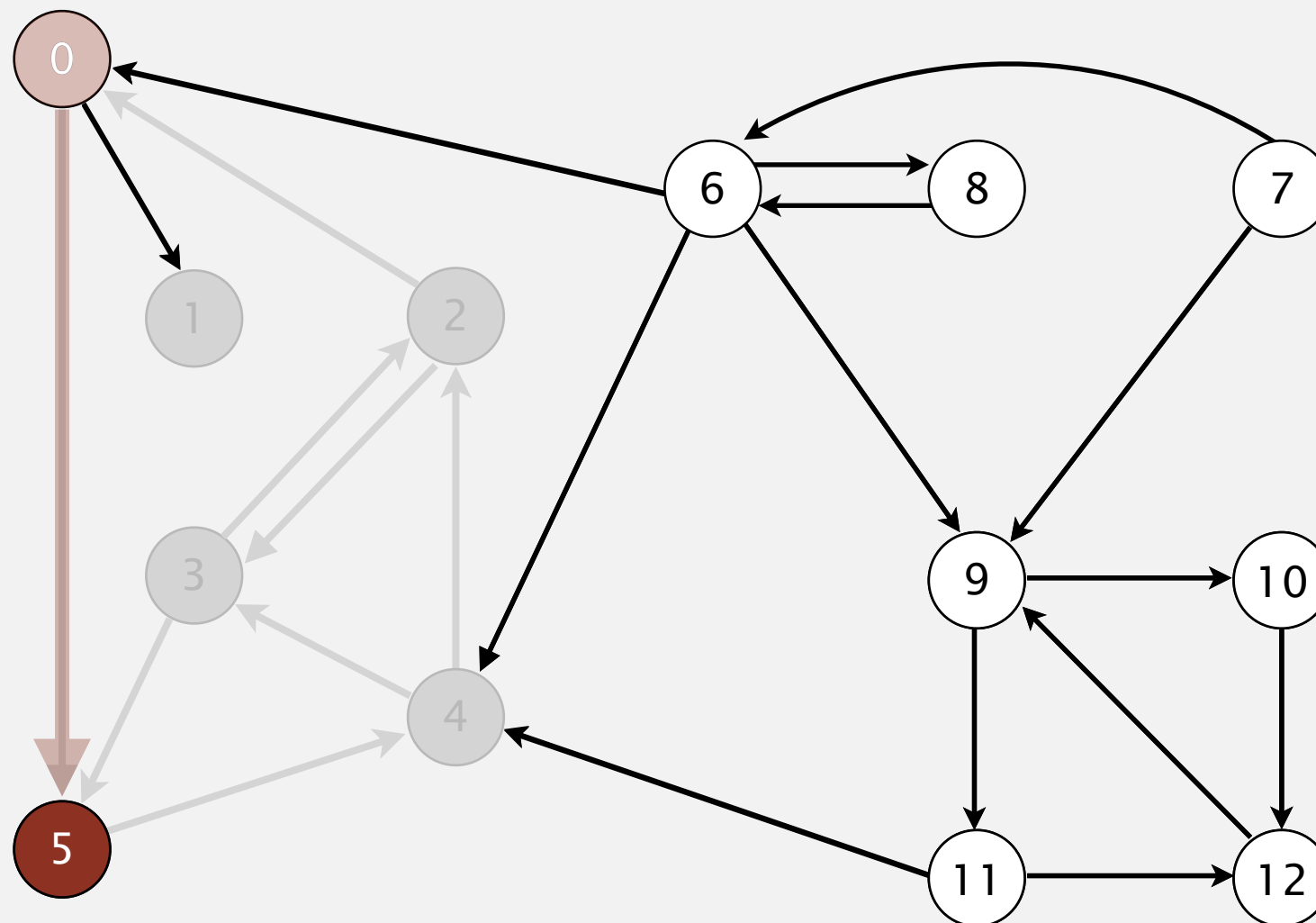


4 done

| v | scc[v] |
|----|--------|
| 0 | 1 |
| 1 | 0 |
| 2 | 1 |
| 3 | 1 |
| 4 | 1 |
| 5 | 1 |
| 6 | - |
| 7 | - |
| 8 | - |
| 9 | - |
| 10 | - |
| 11 | - |
| 12 | - |

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 0 2 4 5 3 11 9 12 10 6 7 8

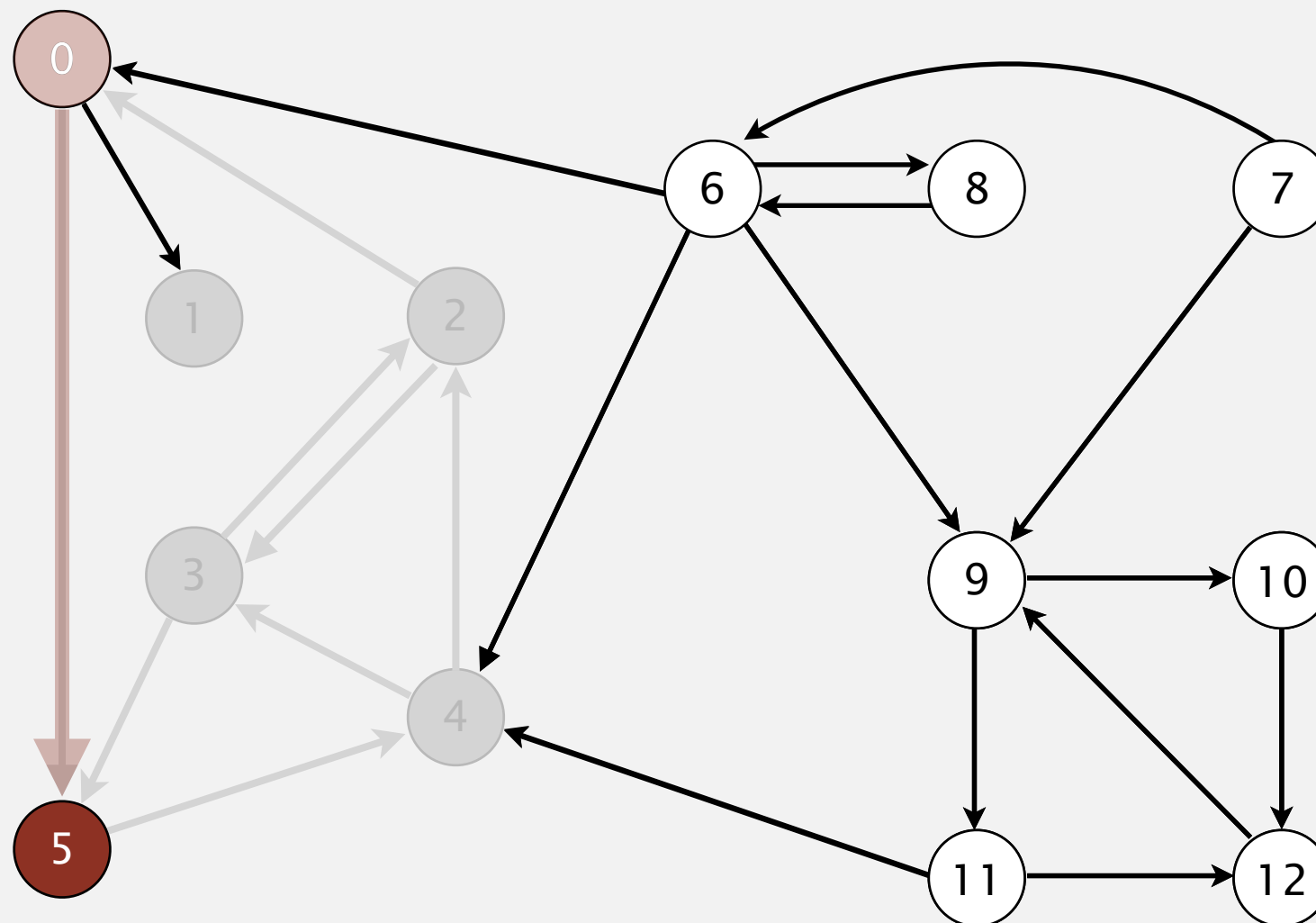


4 done

| v | scc[v] |
|----|--------|
| 0 | 1 |
| 1 | 0 |
| 2 | 1 |
| 3 | 1 |
| 4 | 1 |
| 5 | 1 |
| 6 | - |
| 7 | - |
| 8 | - |
| 9 | - |
| 10 | - |
| 11 | - |
| 12 | - |

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 0 2 4 5 3 11 9 12 10 6 7 8

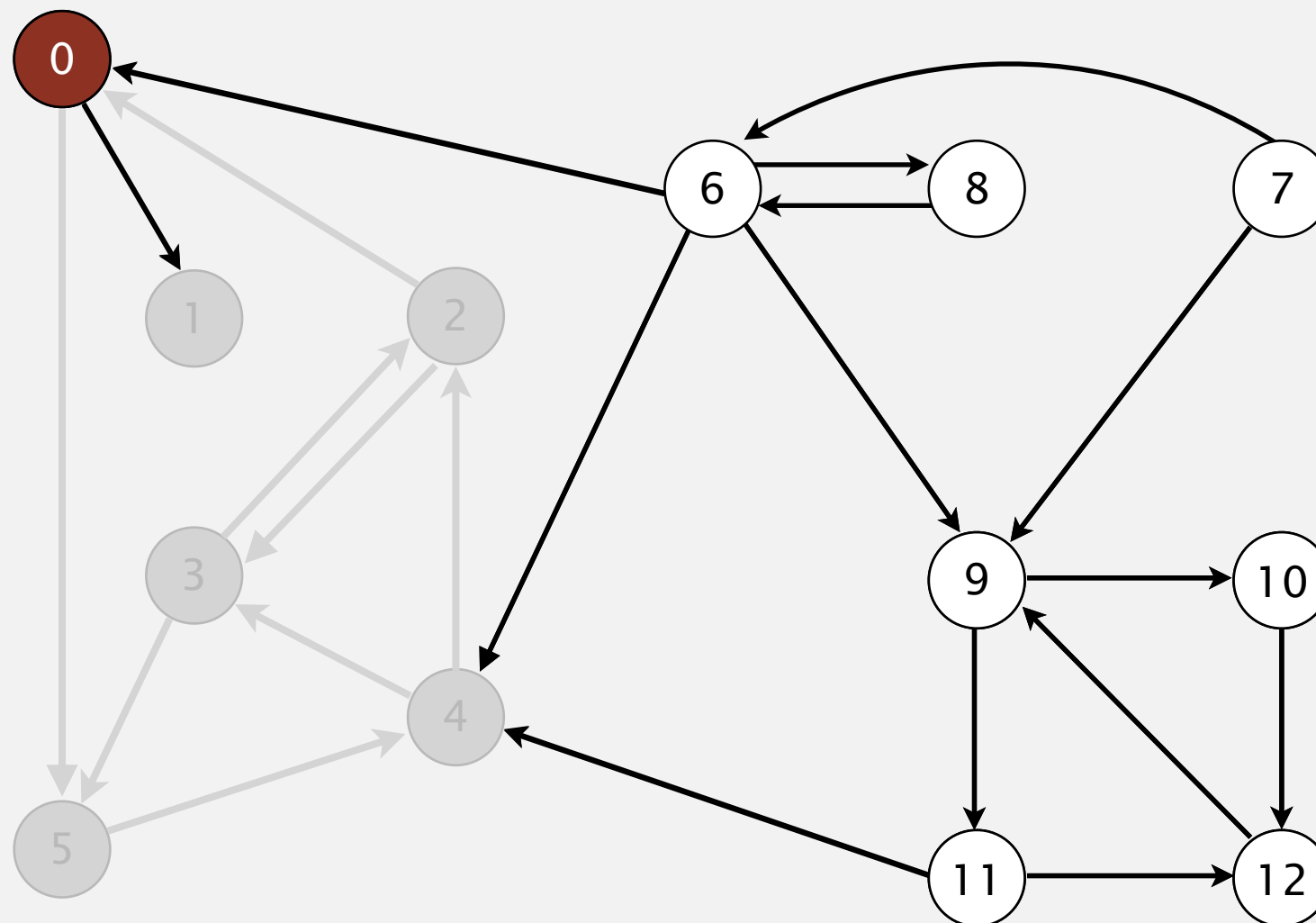


5 done

| v | scc[v] |
|----|--------|
| 0 | 1 |
| 1 | 0 |
| 2 | 1 |
| 3 | 1 |
| 4 | 1 |
| 5 | 1 |
| 6 | - |
| 7 | - |
| 8 | - |
| 9 | - |
| 10 | - |
| 11 | - |
| 12 | - |

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 **0** 2 4 5 3 11 9 12 10 6 7 8

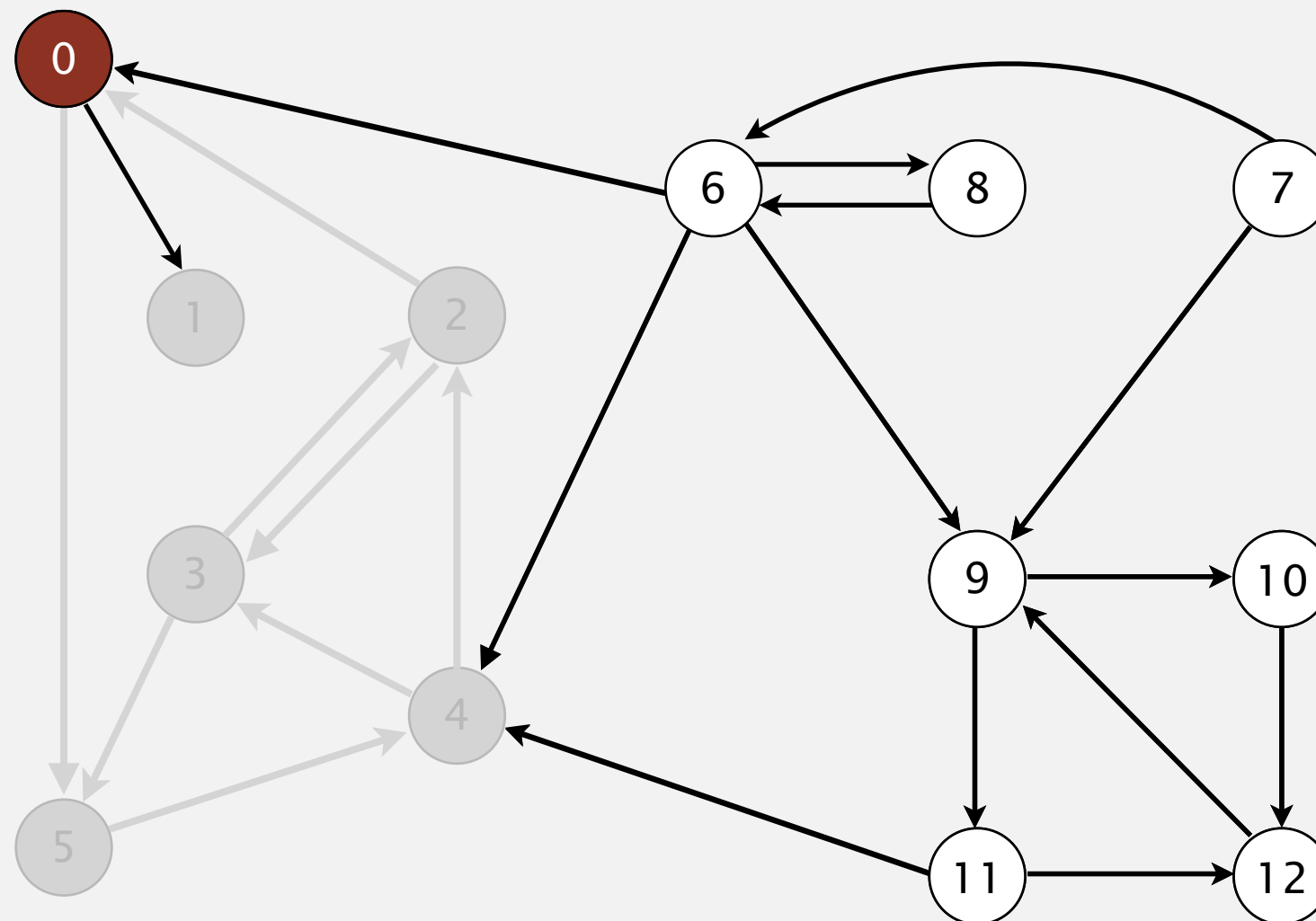


5 done

| v | scc[v] |
|----|--------|
| 0 | 1 |
| 1 | 0 |
| 2 | 1 |
| 3 | 1 |
| 4 | 1 |
| 5 | 1 |
| 6 | - |
| 7 | - |
| 8 | - |
| 9 | - |
| 10 | - |
| 11 | - |
| 12 | - |

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 **0** 2 4 5 3 11 9 12 10 6 7 8

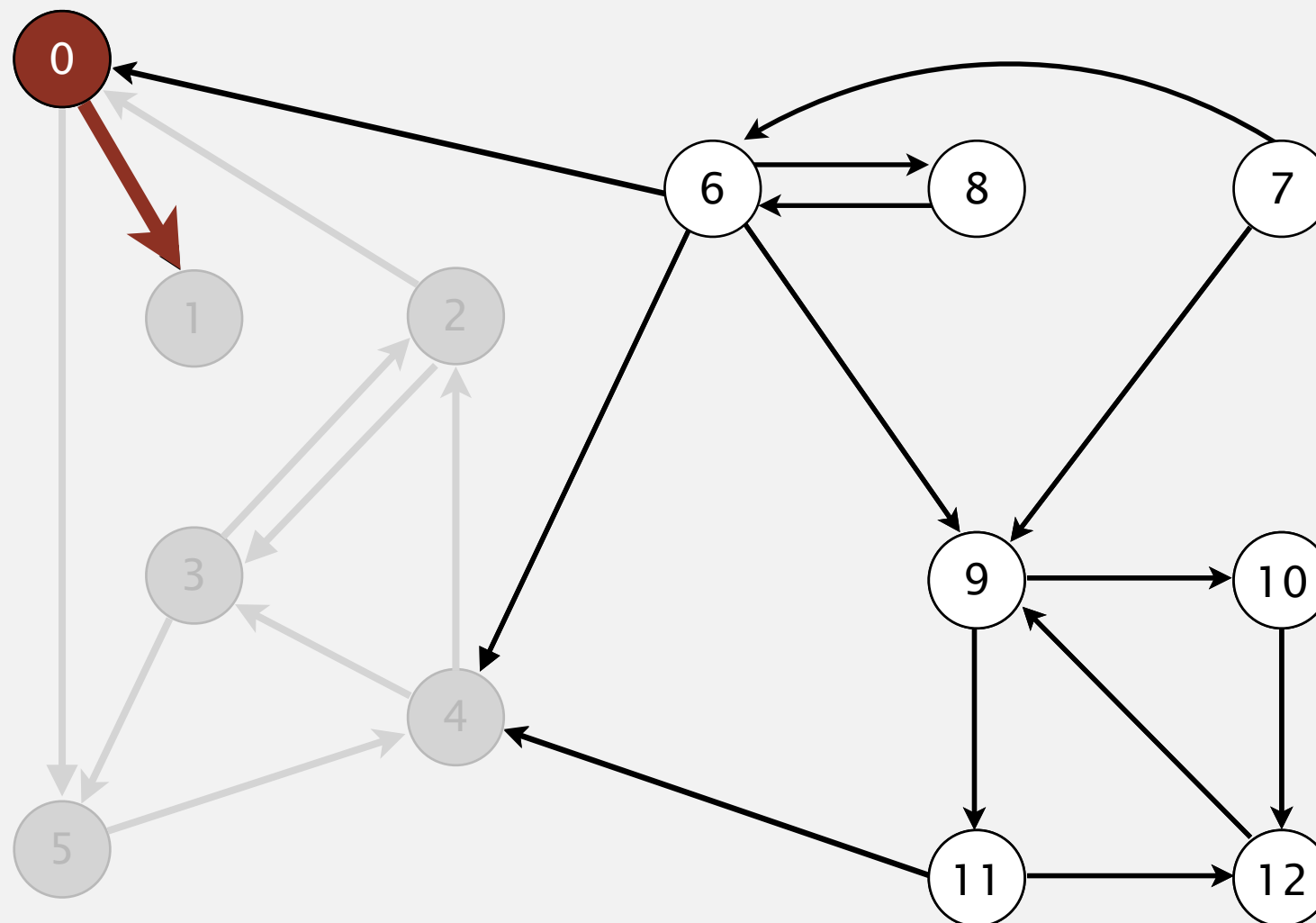


visit 0

| v | scc[v] |
|----|--------|
| 0 | 1 |
| 1 | 0 |
| 2 | 1 |
| 3 | 1 |
| 4 | 1 |
| 5 | 1 |
| 6 | - |
| 7 | - |
| 8 | - |
| 9 | - |
| 10 | - |
| 11 | - |
| 12 | - |

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 **0** 2 4 5 3 11 9 12 10 6 7 8

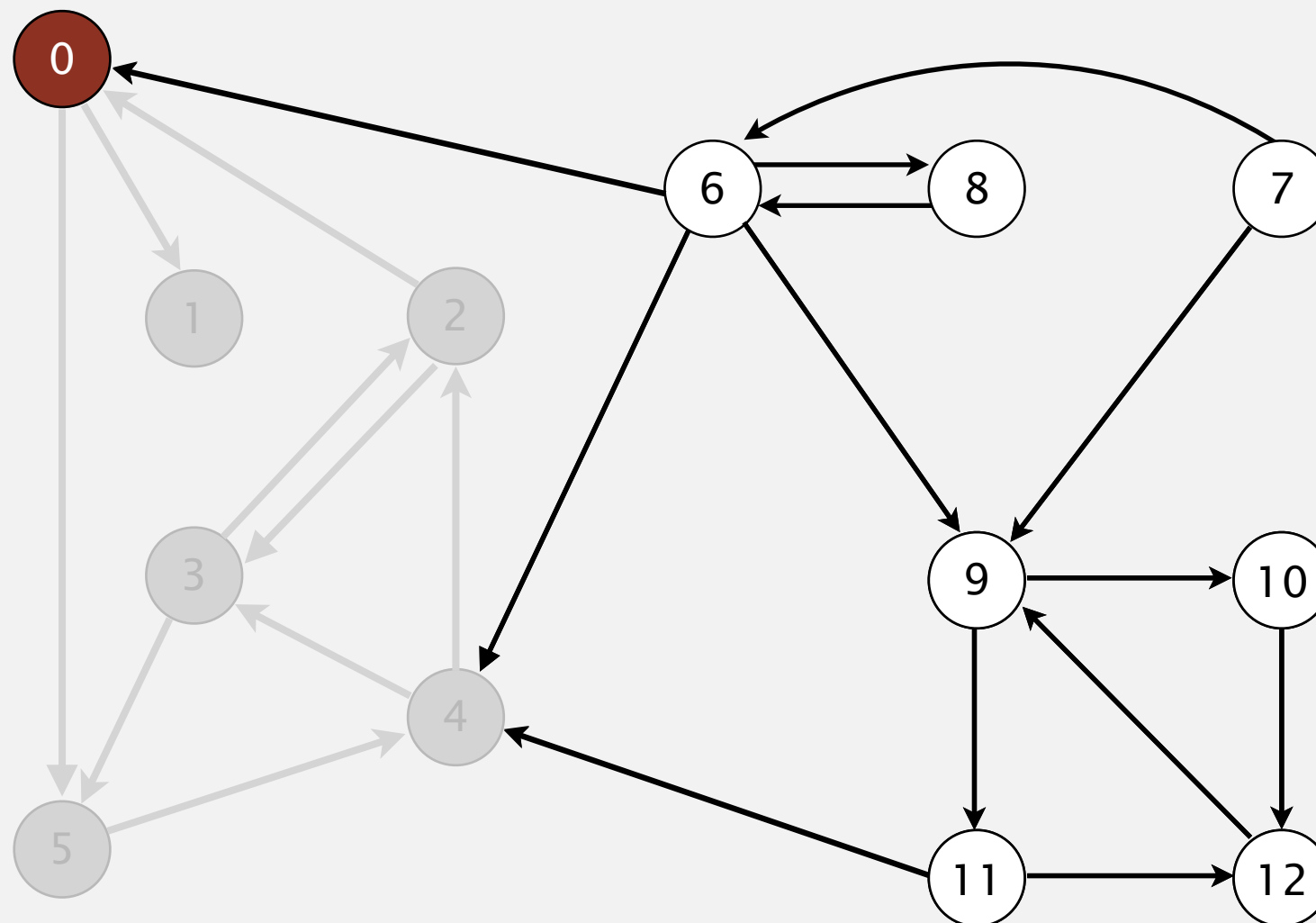


visit 0

| v | scc[v] |
|----|--------|
| 0 | 1 |
| 1 | 0 |
| 2 | 1 |
| 3 | 1 |
| 4 | 1 |
| 5 | 1 |
| 6 | - |
| 7 | - |
| 8 | - |
| 9 | - |
| 10 | - |
| 11 | - |
| 12 | - |

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 **0** 2 4 5 3 11 9 12 10 6 7 8

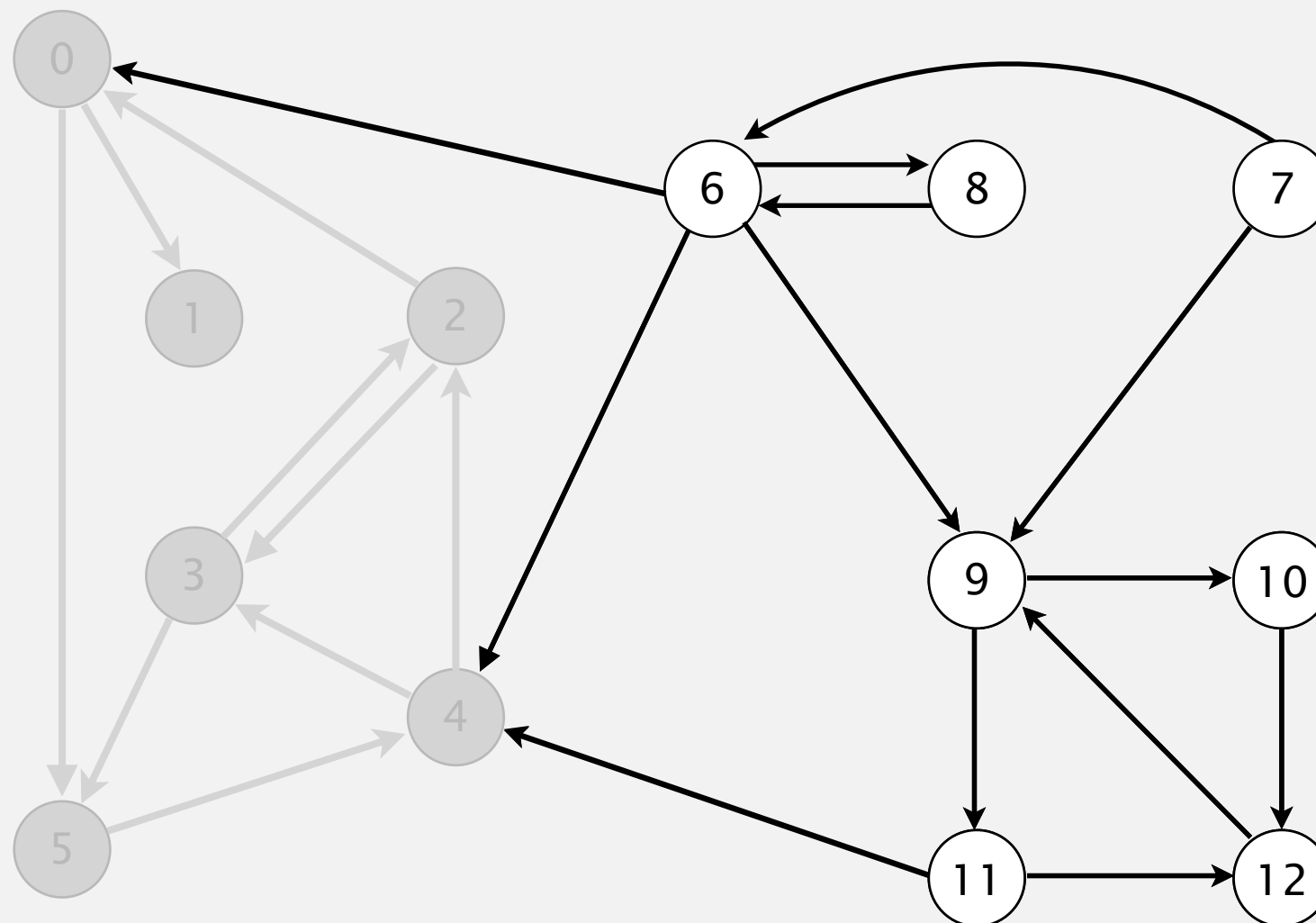


0 done

| v | scc[v] |
|----|--------|
| 0 | 1 |
| 1 | 0 |
| 2 | 1 |
| 3 | 1 |
| 4 | 1 |
| 5 | 1 |
| 6 | - |
| 7 | - |
| 8 | - |
| 9 | - |
| 10 | - |
| 11 | - |
| 12 | - |

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 **0** 2 4 5 3 11 9 12 10 6 7 8

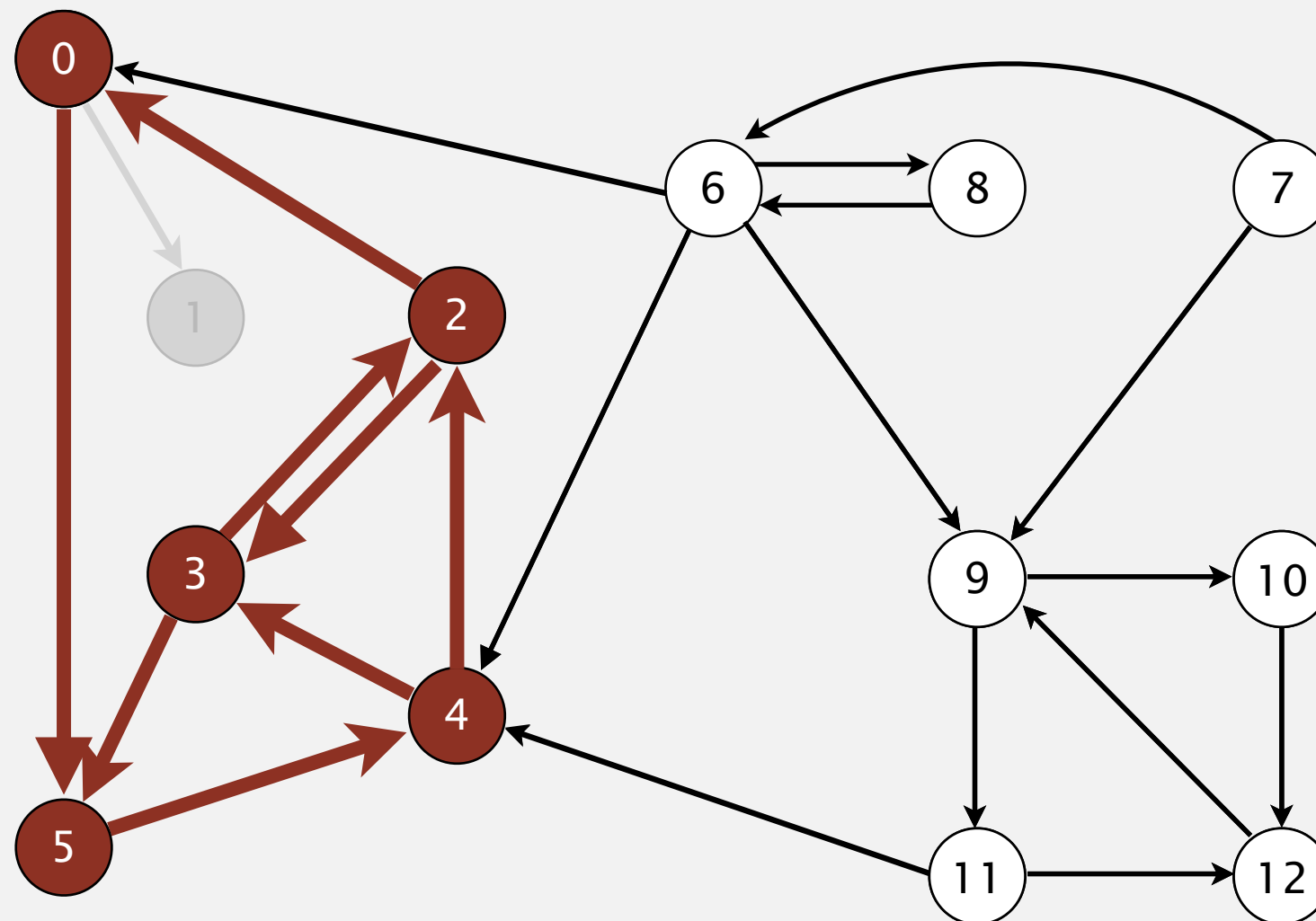


0 done

| v | scc[v] |
|----------|---------------|
| 0 | 1 |
| 1 | 0 |
| 2 | 1 |
| 3 | 1 |
| 4 | 1 |
| 5 | 1 |
| 6 | - |
| 7 | - |
| 8 | - |
| 9 | - |
| 10 | - |
| 11 | - |
| 12 | - |

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 **0** 2 4 5 3 11 9 12 10 6 7 8

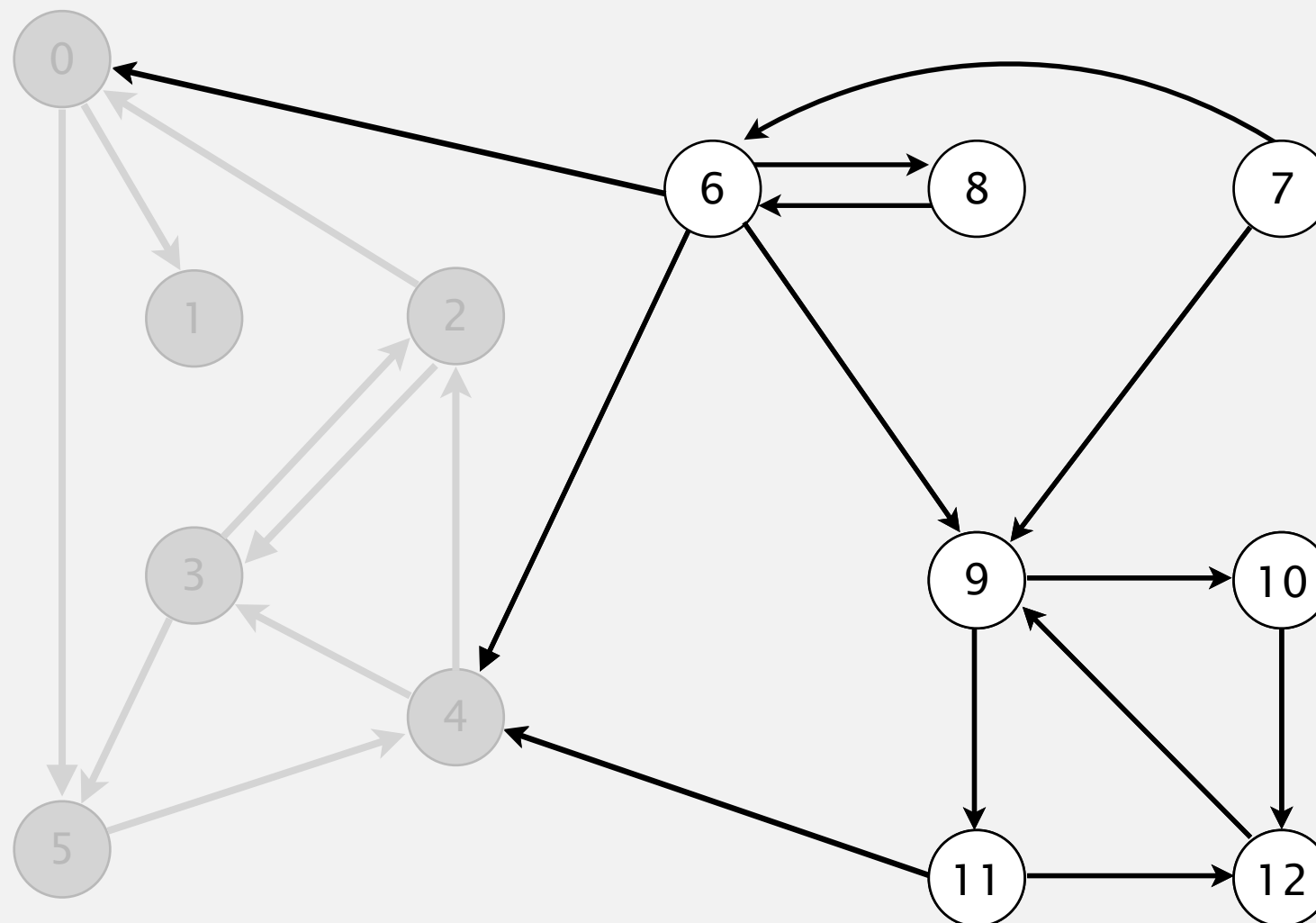


strong component: 0 2 3 4 5

| v | scc[v] |
|----------|---------------|
| 0 | 1 |
| 1 | 0 |
| 2 | 1 |
| 3 | 1 |
| 4 | 1 |
| 5 | 1 |
| 6 | - |
| 7 | - |
| 8 | - |
| 9 | - |
| 10 | - |
| 11 | - |
| 12 | - |

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 0 **2** 4 5 3 11 9 12 10 6 7 8

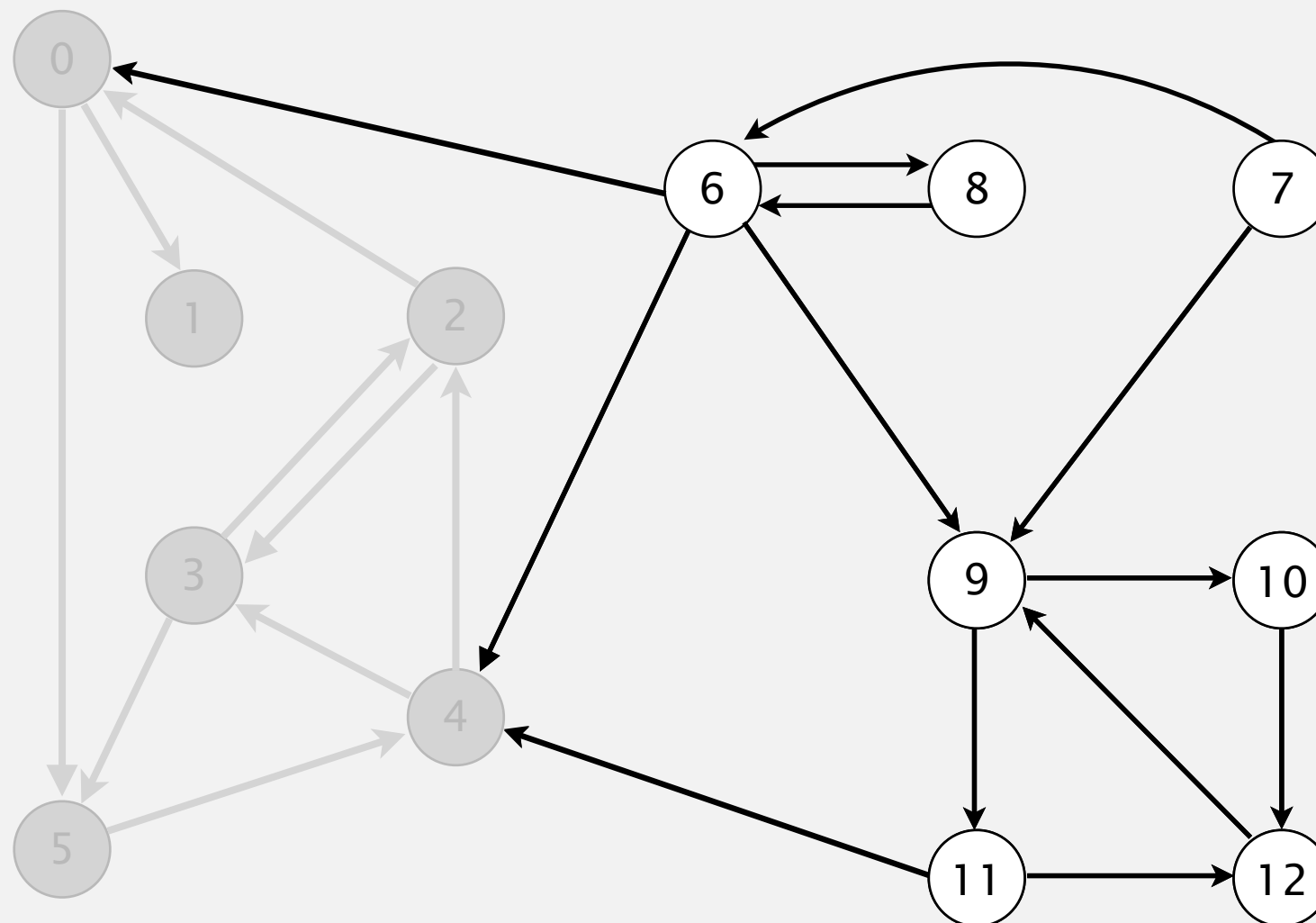


| v | scc[v] |
|----------|---------------|
| 0 | 1 |
| 1 | 0 |
| 2 | 1 |
| 3 | 1 |
| 4 | 1 |
| 5 | 1 |
| 6 | - |
| 7 | - |
| 8 | - |
| 9 | - |
| 10 | - |
| 11 | - |
| 12 | - |

check 2

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 0 2 **4** 5 3 11 9 12 10 6 7 8

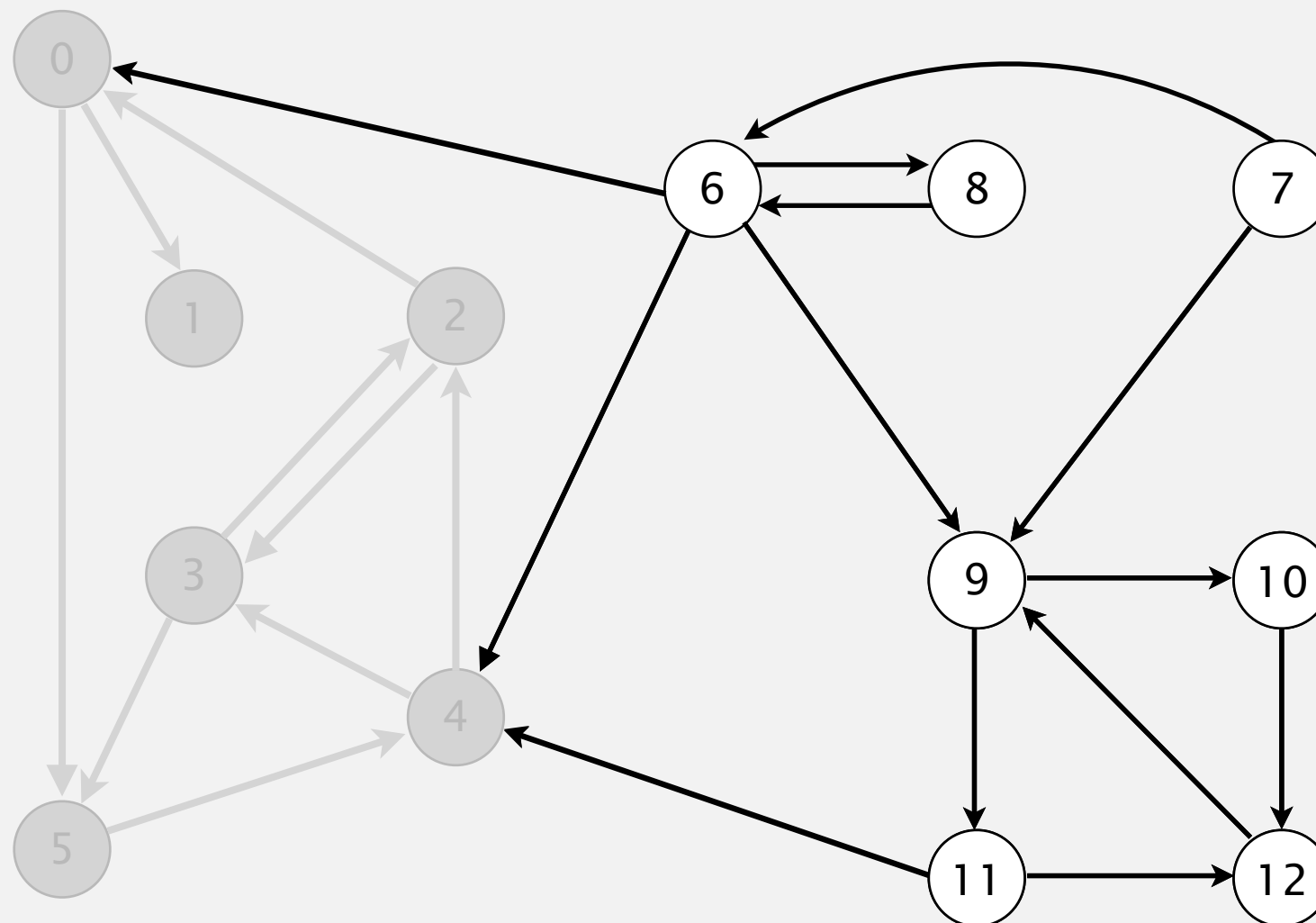


check 4

| v | scc[v] |
|----------|---------------|
| 0 | 1 |
| 1 | 0 |
| 2 | 1 |
| 3 | 1 |
| 4 | 1 |
| 5 | 1 |
| 6 | - |
| 7 | - |
| 8 | - |
| 9 | - |
| 10 | - |
| 11 | - |
| 12 | - |

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 0 2 4 **5** 3 11 9 12 10 6 7 8

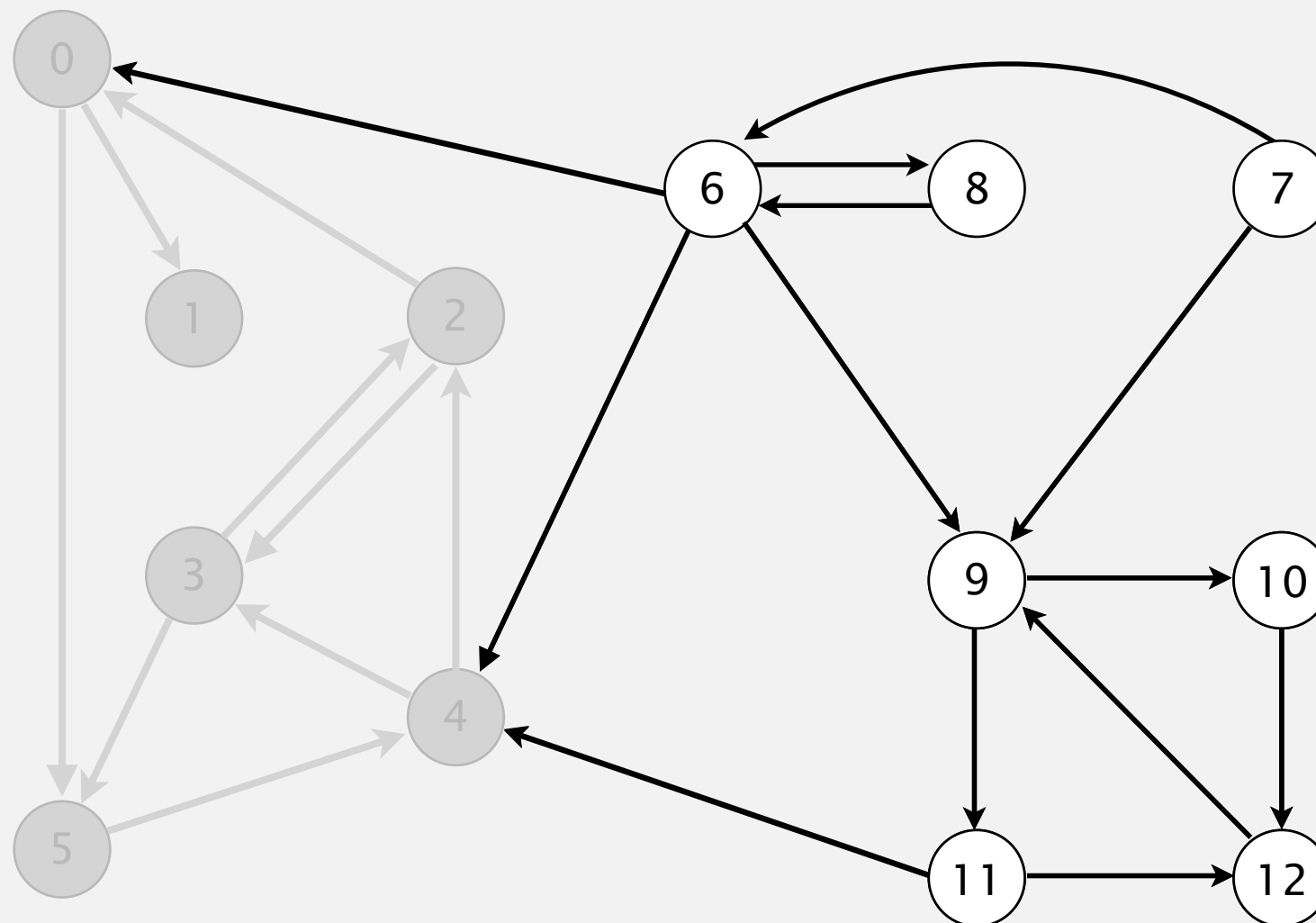


check 5

| v | scc[v] |
|----------|---------------|
| 0 | 1 |
| 1 | 0 |
| 2 | 1 |
| 3 | 1 |
| 4 | 1 |
| 5 | 1 |
| 6 | - |
| 7 | - |
| 8 | - |
| 9 | - |
| 10 | - |
| 11 | - |
| 12 | - |

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 0 2 4 5 **3** 11 9 12 10 6 7 8

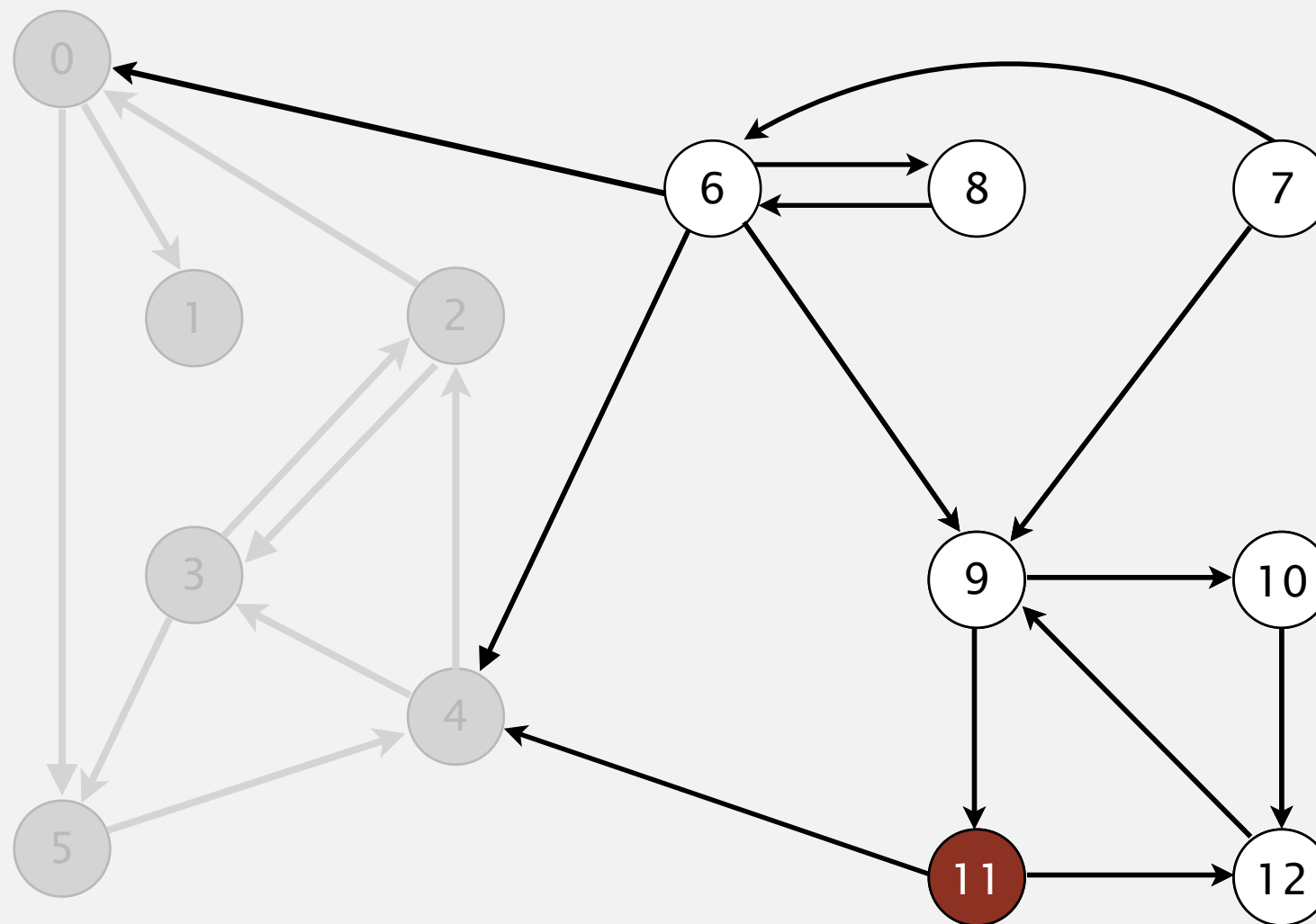


check 3

| v | scc[v] |
|----|--------|
| 0 | 1 |
| 1 | 0 |
| 2 | 1 |
| 3 | 1 |
| 4 | 1 |
| 5 | 1 |
| 6 | - |
| 7 | - |
| 8 | - |
| 9 | - |
| 10 | - |
| 11 | - |
| 12 | - |

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 0 2 4 5 3 **11** 9 12 10 6 7 8

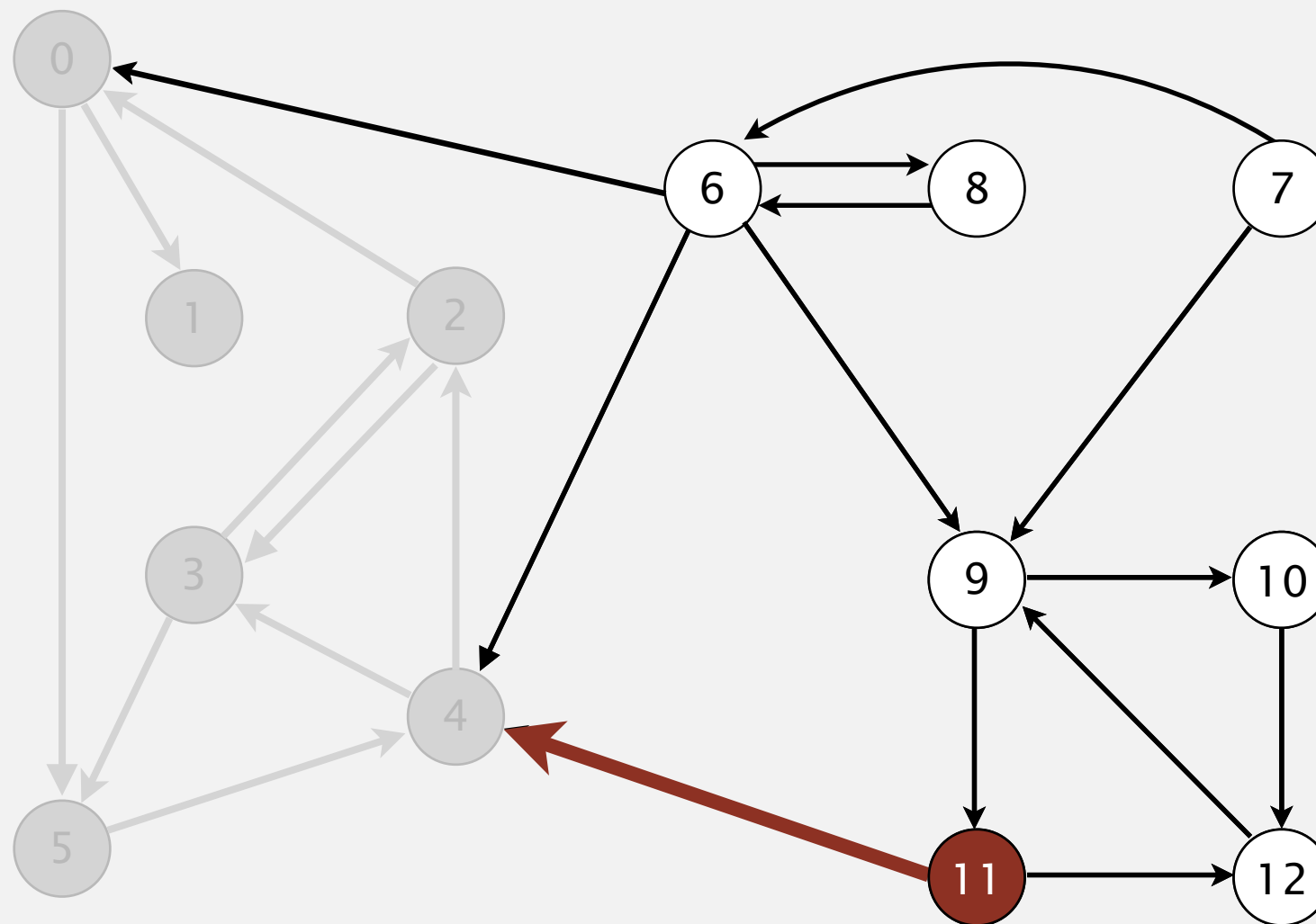


visit 11

| v | scc[v] |
|----------|---------------|
| 0 | 1 |
| 1 | 0 |
| 2 | 1 |
| 3 | 1 |
| 4 | 1 |
| 5 | 1 |
| 6 | - |
| 7 | - |
| 8 | - |
| 9 | - |
| 10 | - |
| 11 | 2 |
| 12 | - |

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 0 2 4 5 3 **11** 9 12 10 6 7 8

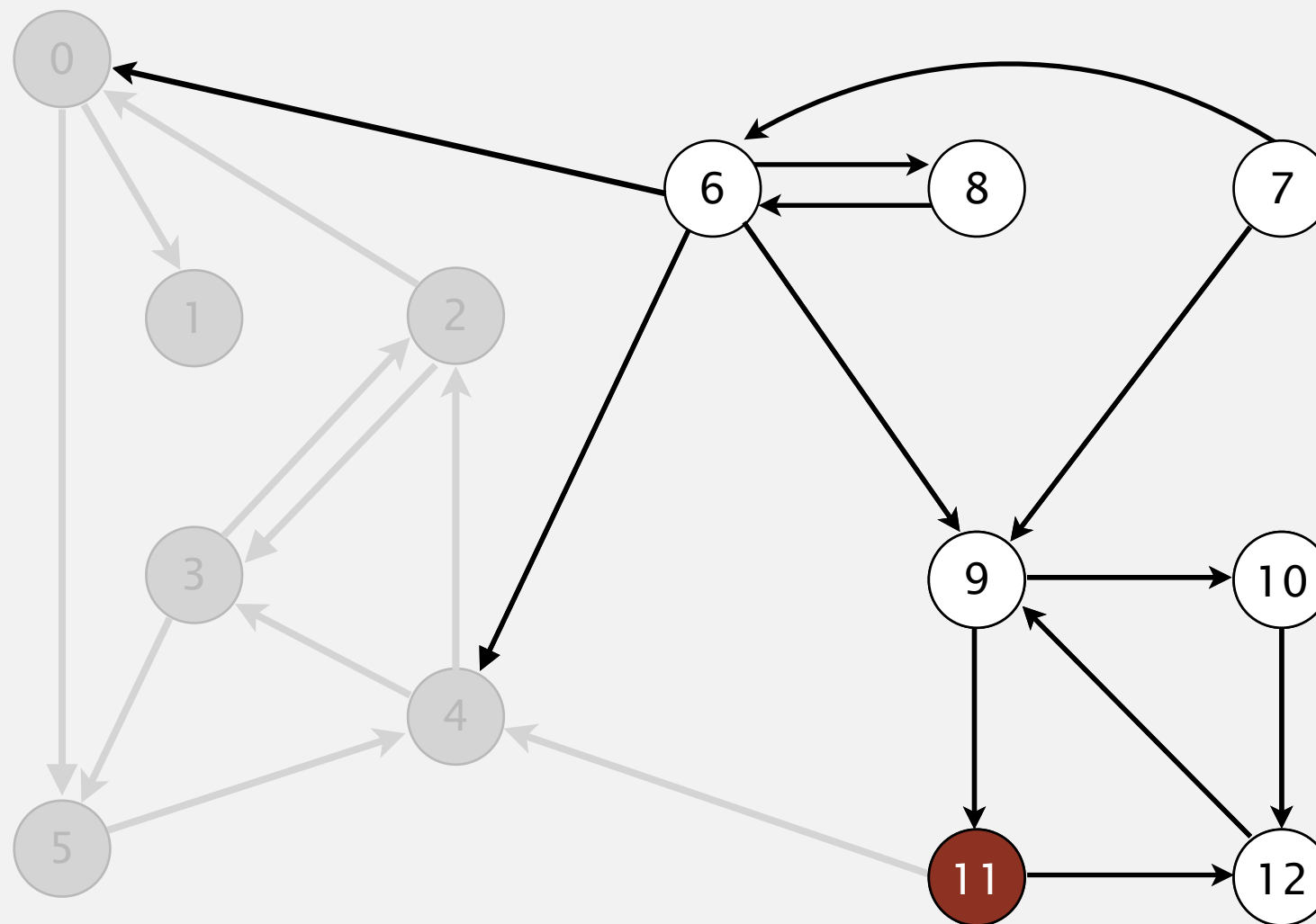


visit 11

| v | scc[v] |
|----------|---------------|
| 0 | 1 |
| 1 | 0 |
| 2 | 1 |
| 3 | 1 |
| 4 | 1 |
| 5 | 1 |
| 6 | - |
| 7 | - |
| 8 | - |
| 9 | - |
| 10 | - |
| 11 | 2 |
| 12 | - |

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 0 2 4 5 3 **11** 9 12 10 6 7 8

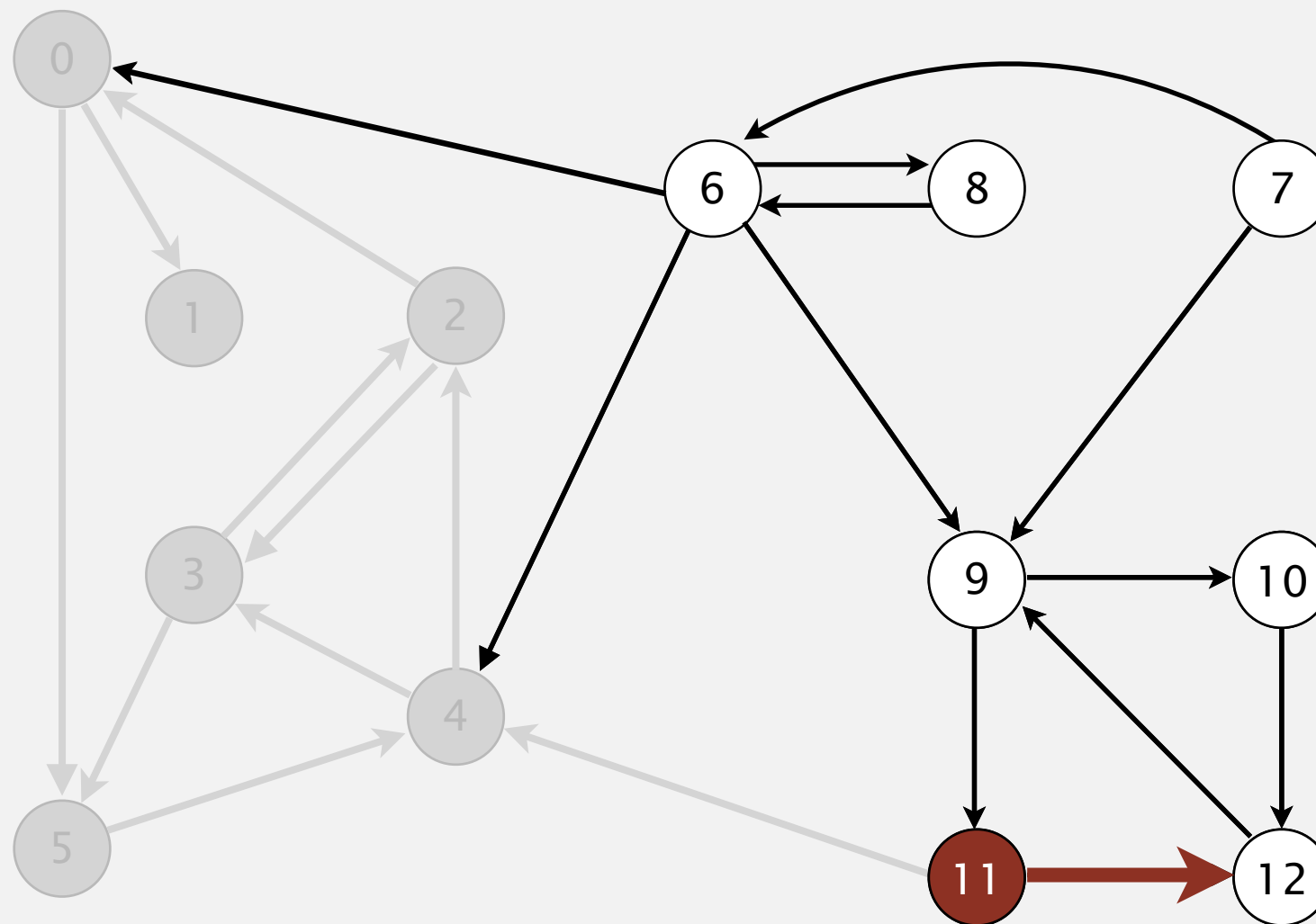


visit 11

| v | scc[v] |
|----------|---------------|
| 0 | 1 |
| 1 | 0 |
| 2 | 1 |
| 3 | 1 |
| 4 | 1 |
| 5 | 1 |
| 6 | - |
| 7 | - |
| 8 | - |
| 9 | - |
| 10 | - |
| 11 | 2 |
| 12 | - |

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 0 2 4 5 3 **11** 9 12 10 6 7 8

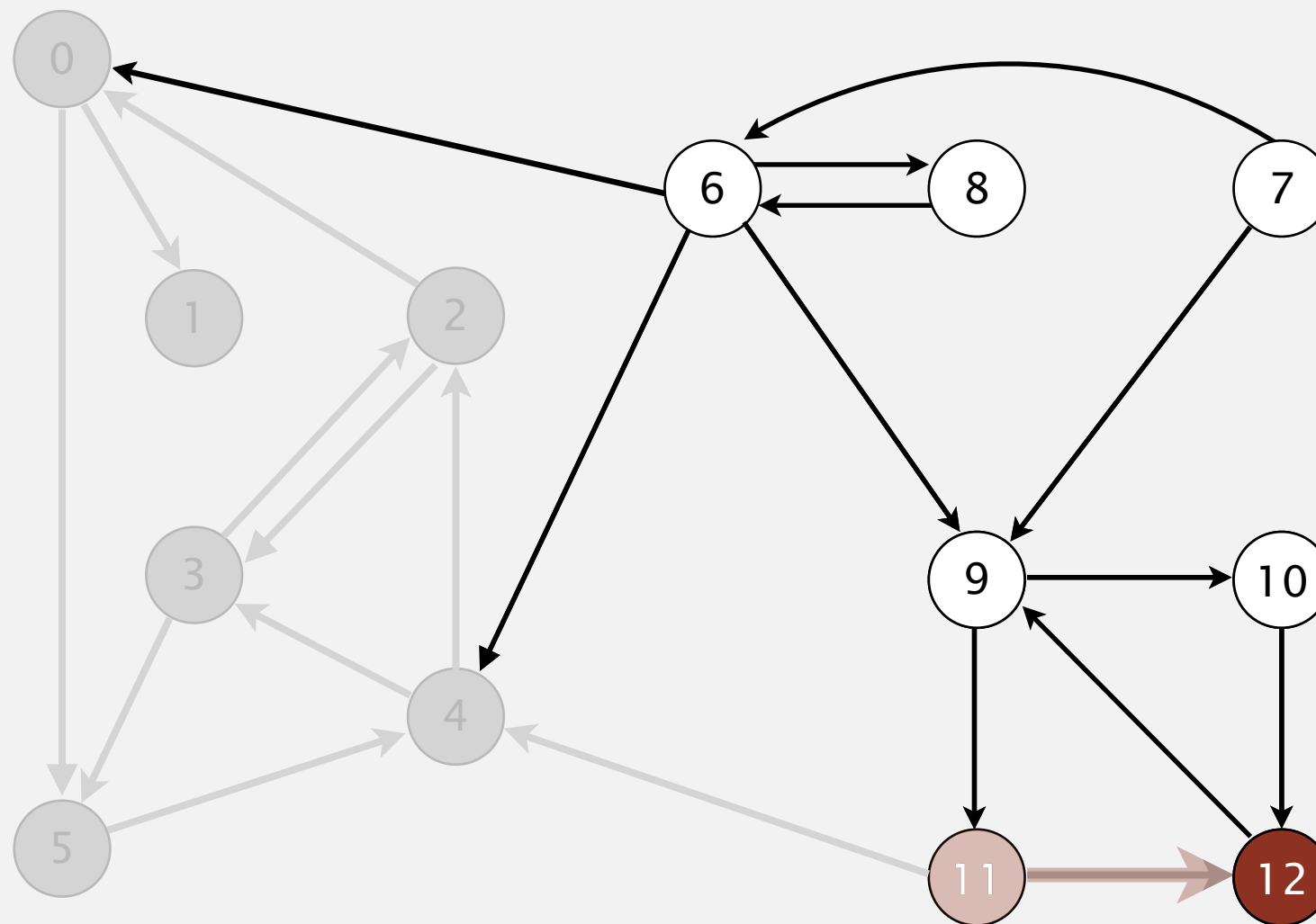


visit 11

| v | scc[v] |
|----------|---------------|
| 0 | 1 |
| 1 | 0 |
| 2 | 1 |
| 3 | 1 |
| 4 | 1 |
| 5 | 1 |
| 6 | - |
| 7 | - |
| 8 | - |
| 9 | - |
| 10 | - |
| 11 | 2 |
| 12 | - |

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 0 2 4 5 3 **11** 9 12 10 6 7 8

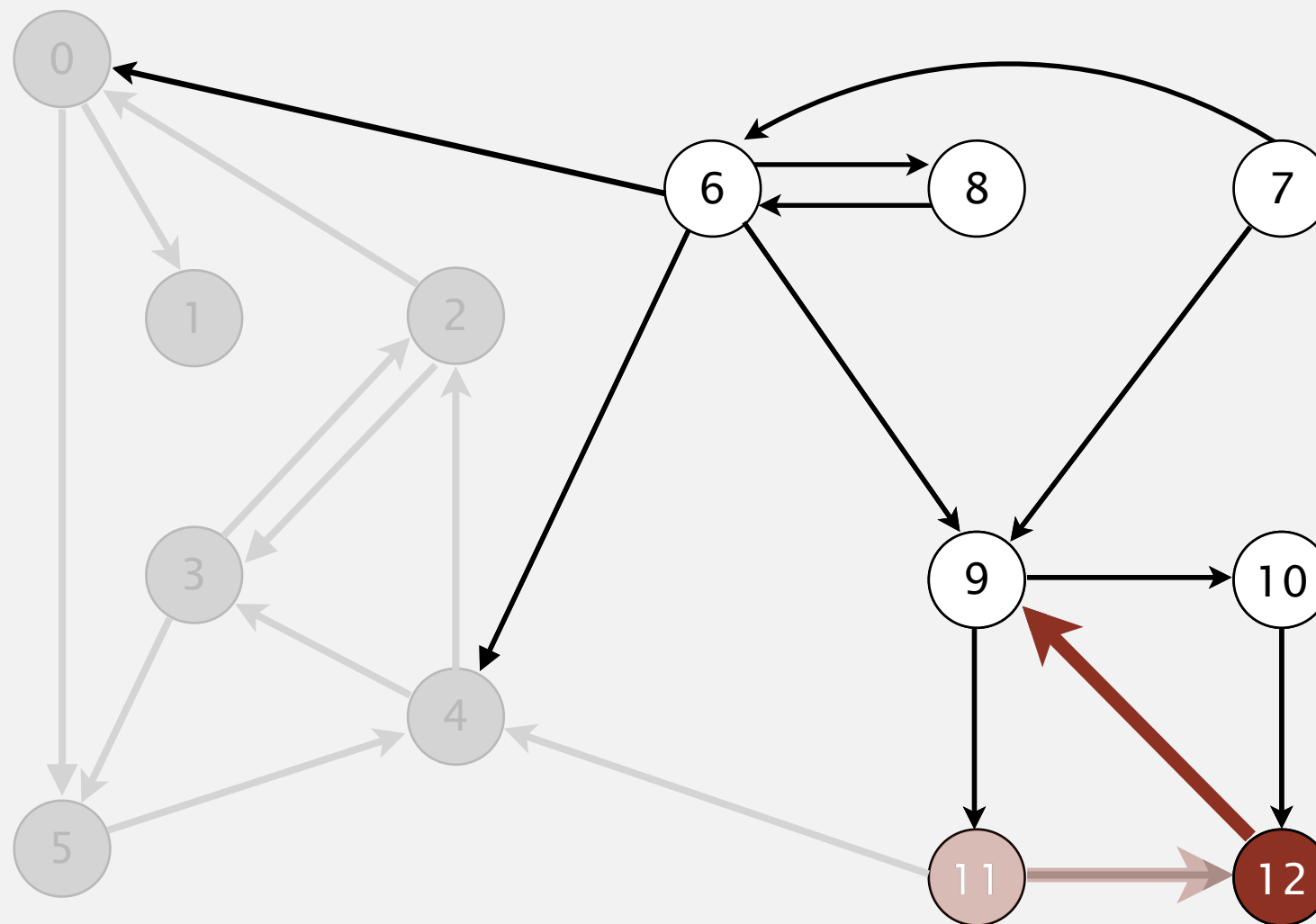


visit 12

| v | scc[v] |
|----------|---------------|
| 0 | 1 |
| 1 | 0 |
| 2 | 1 |
| 3 | 1 |
| 4 | 1 |
| 5 | 1 |
| 6 | - |
| 7 | - |
| 8 | - |
| 9 | - |
| 10 | - |
| 11 | 2 |
| 12 | 2 |

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 0 2 4 5 3 **11** 9 12 10 6 7 8

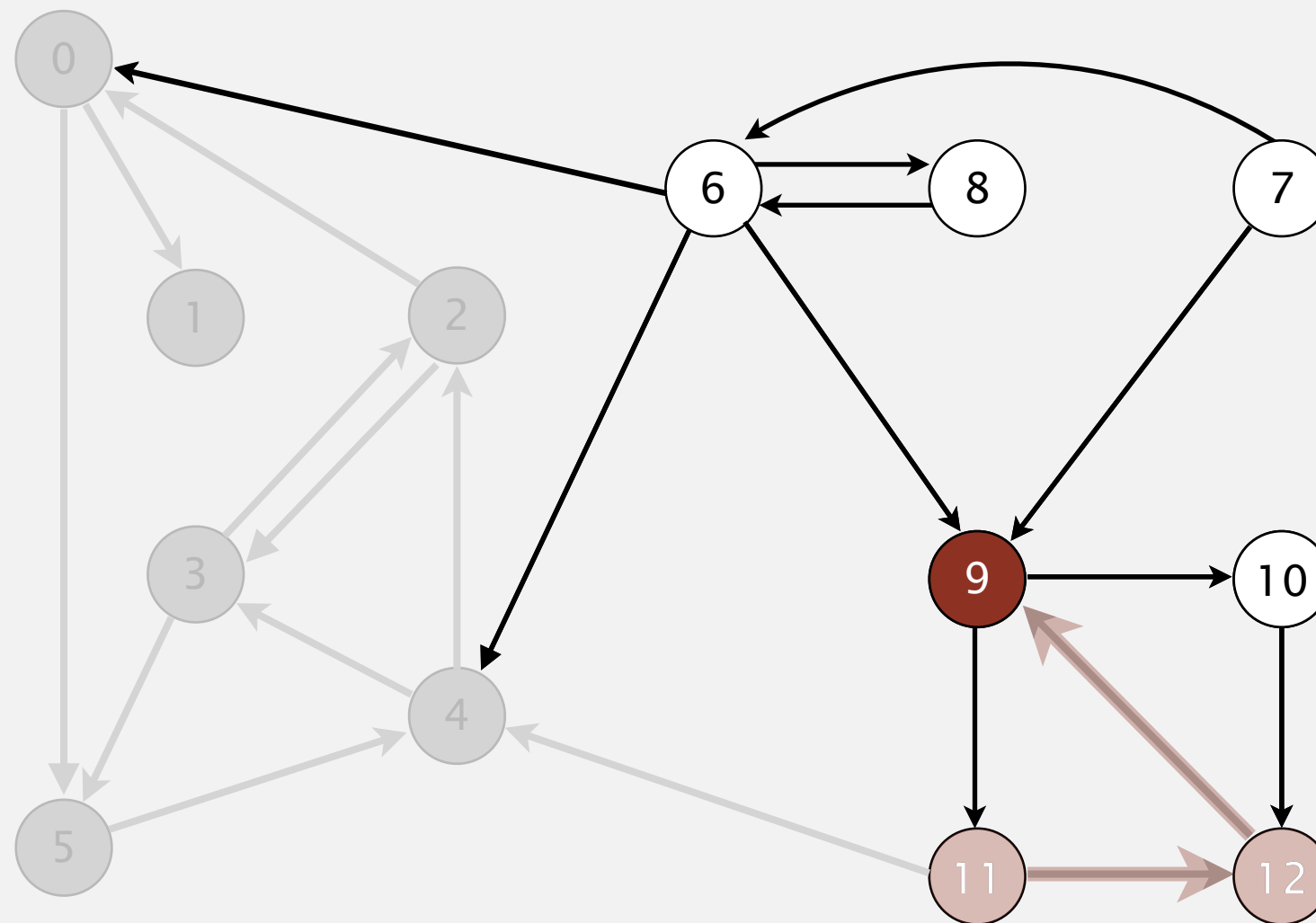


visit 12

| v | scc[v] |
|----------|---------------|
| 0 | 1 |
| 1 | 0 |
| 2 | 1 |
| 3 | 1 |
| 4 | 1 |
| 5 | 1 |
| 6 | - |
| 7 | - |
| 8 | - |
| 9 | - |
| 10 | - |
| 11 | 2 |
| 12 | 2 |

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 0 2 4 5 3 **11** 9 12 10 6 7 8

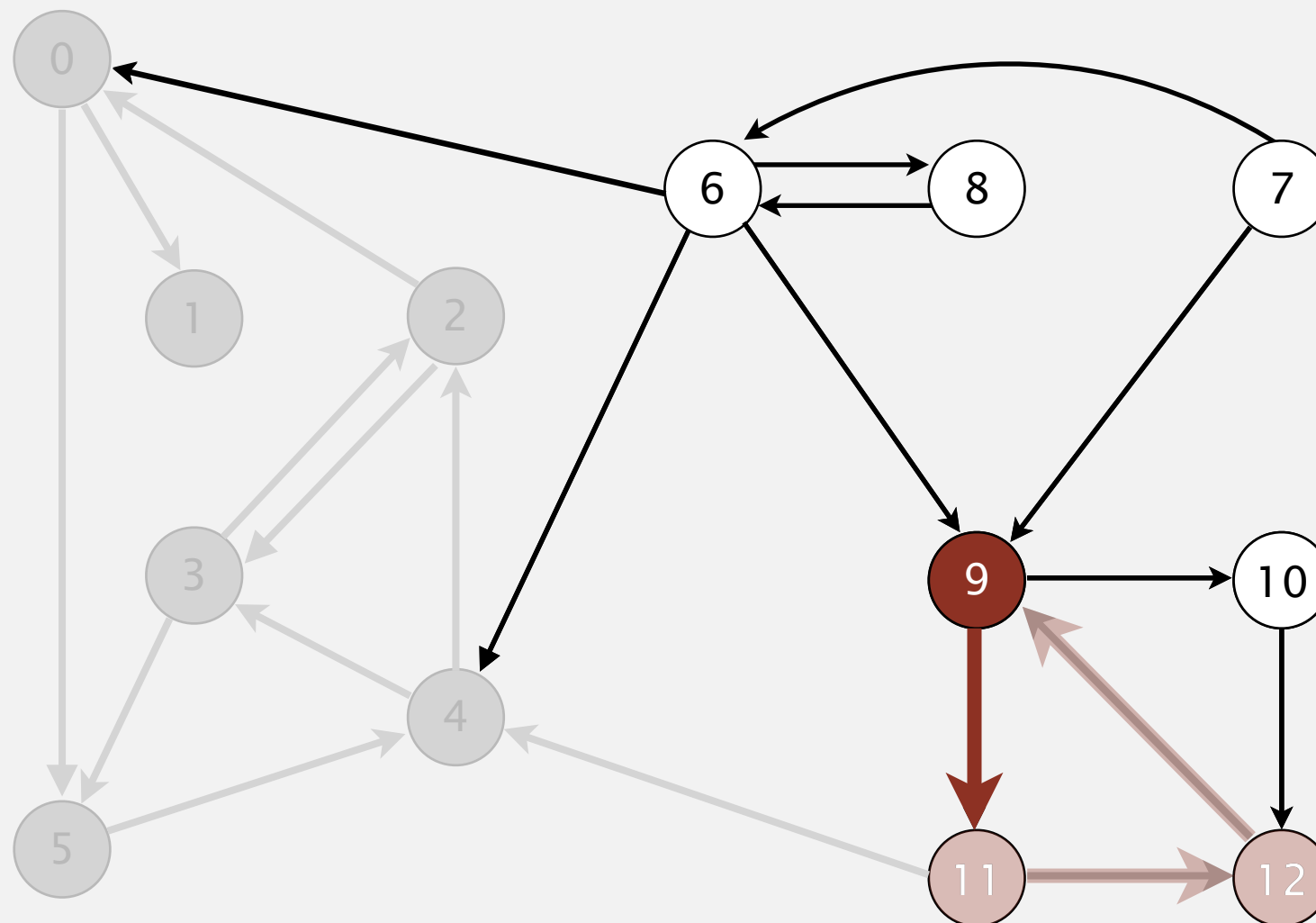


visit 9

| v | scc[v] |
|----------|---------------|
| 0 | 1 |
| 1 | 0 |
| 2 | 1 |
| 3 | 1 |
| 4 | 1 |
| 5 | 1 |
| 6 | - |
| 7 | - |
| 8 | - |
| 9 | 2 |
| 10 | - |
| 11 | 2 |
| 12 | 2 |

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 0 2 4 5 3 **11** 9 12 10 6 7 8

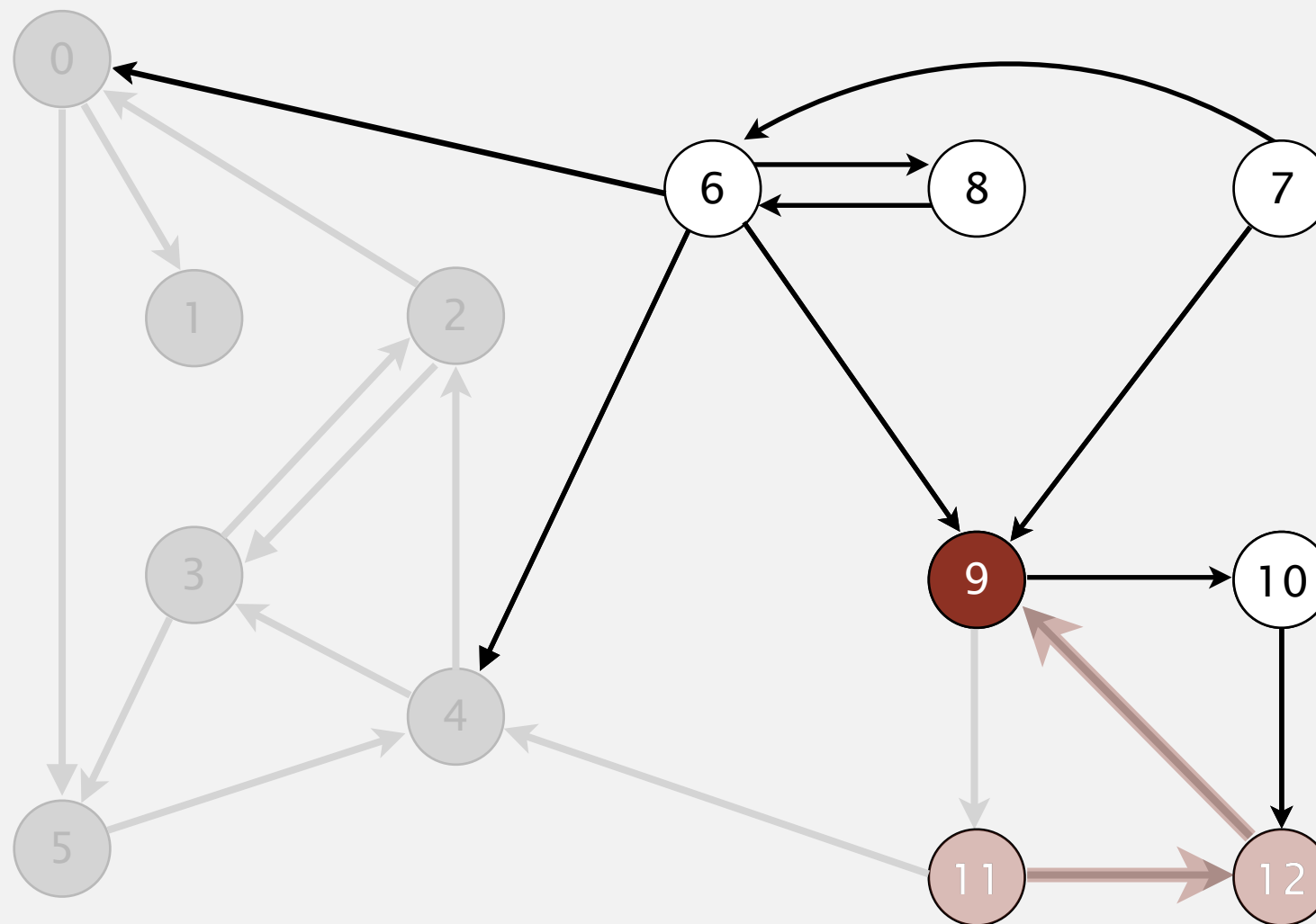


visit 9

| v | scc[v] |
|----------|---------------|
| 0 | 1 |
| 1 | 0 |
| 2 | 1 |
| 3 | 1 |
| 4 | 1 |
| 5 | 1 |
| 6 | - |
| 7 | - |
| 8 | - |
| 9 | 2 |
| 10 | - |
| 11 | 2 |
| 12 | 2 |

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 0 2 4 5 3 **11** 9 12 10 6 7 8

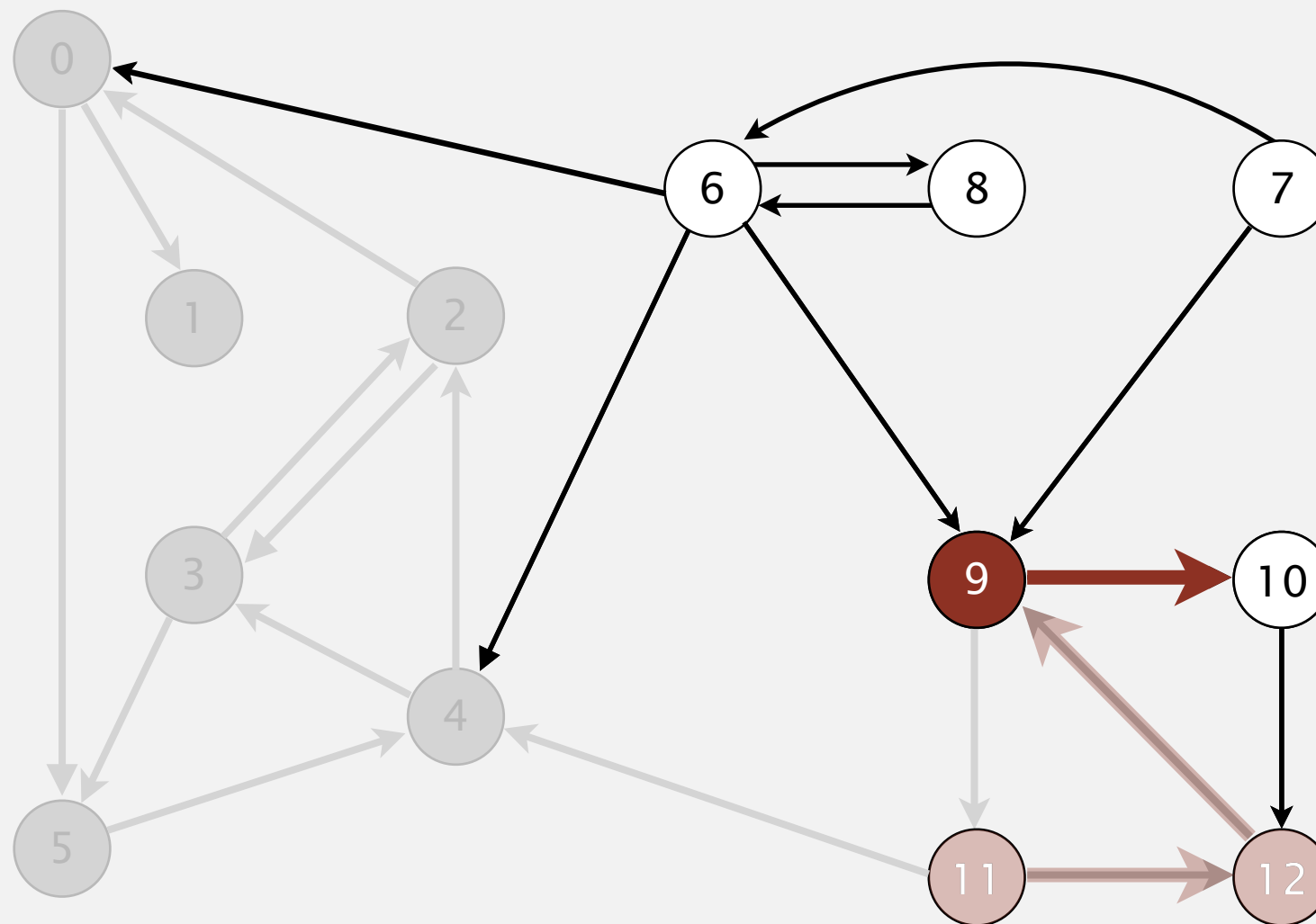


visit 9

| v | scc[v] |
|----|--------|
| 0 | 1 |
| 1 | 0 |
| 2 | 1 |
| 3 | 1 |
| 4 | 1 |
| 5 | 1 |
| 6 | - |
| 7 | - |
| 8 | - |
| 9 | 2 |
| 10 | - |
| 11 | 2 |
| 12 | 2 |

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 0 2 4 5 3 **11** 9 12 10 6 7 8

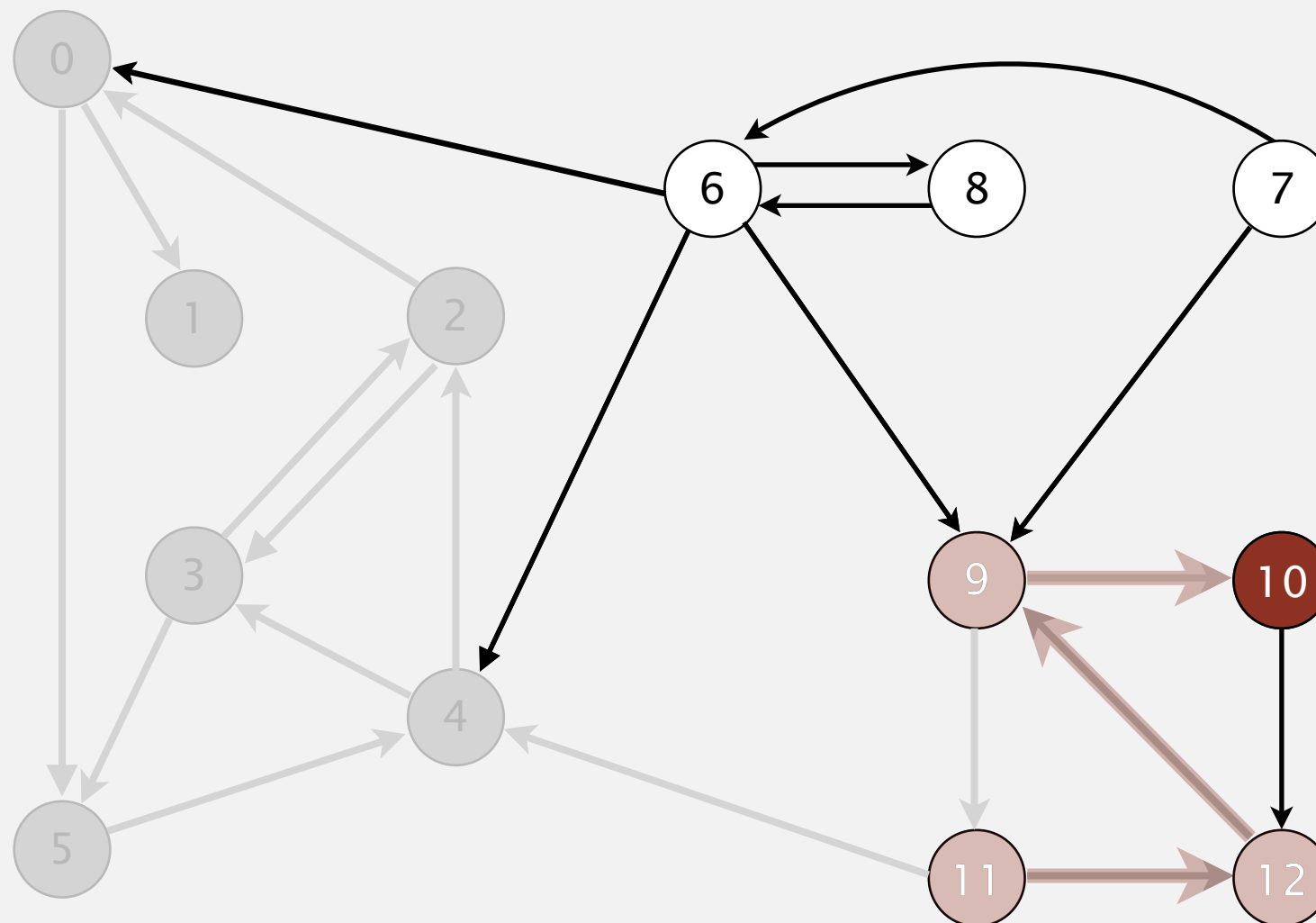


visit 9

| v | scc[v] |
|----------|---------------|
| 0 | 1 |
| 1 | 0 |
| 2 | 1 |
| 3 | 1 |
| 4 | 1 |
| 5 | 1 |
| 6 | - |
| 7 | - |
| 8 | - |
| 9 | 2 |
| 10 | - |
| 11 | 2 |
| 12 | 2 |

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 0 2 4 5 3 **11** 9 12 10 6 7 8

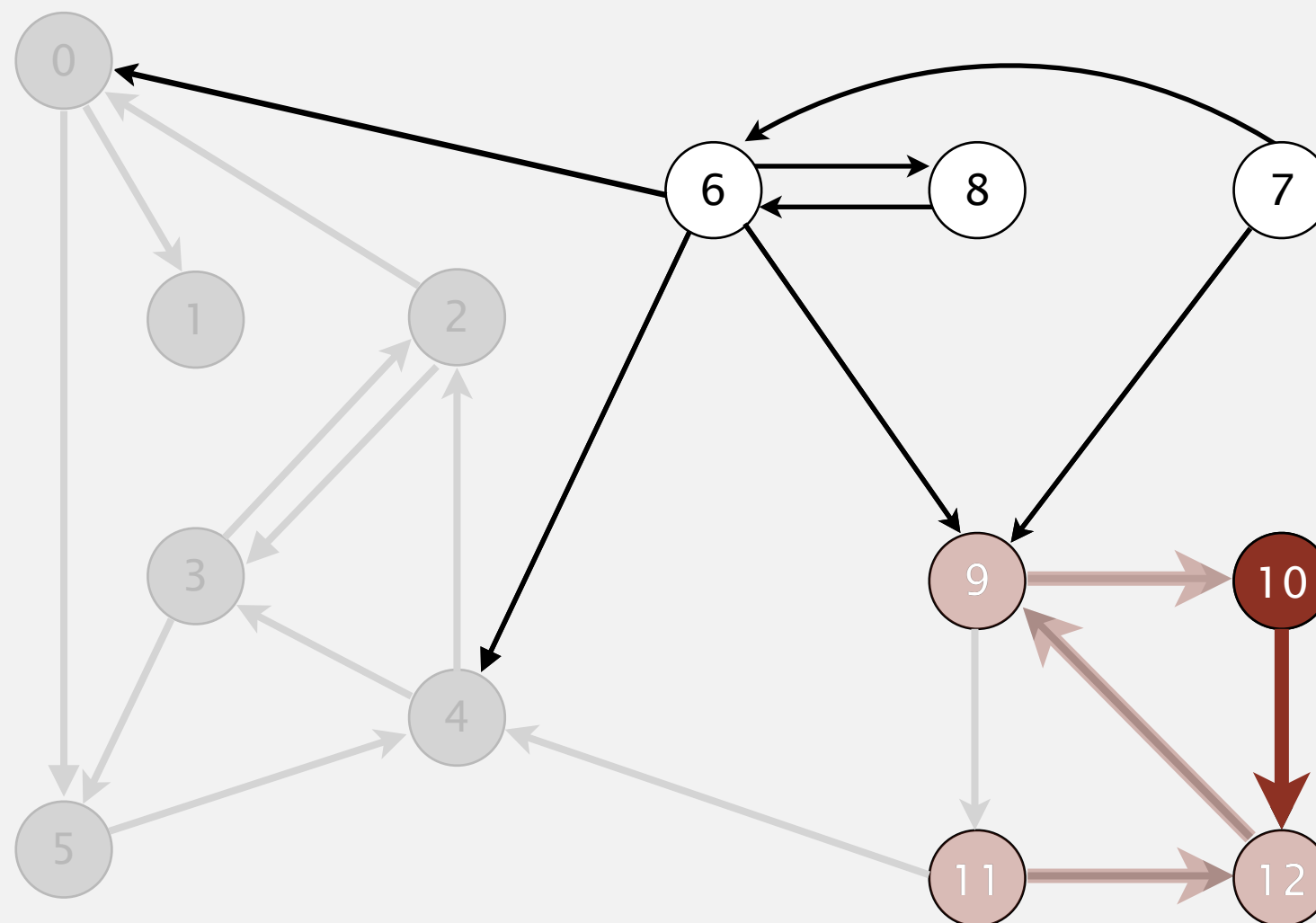


visit 10

| v | scc[v] |
|----------|---------------|
| 0 | 1 |
| 1 | 0 |
| 2 | 1 |
| 3 | 1 |
| 4 | 1 |
| 5 | 1 |
| 6 | - |
| 7 | - |
| 8 | - |
| 9 | 2 |
| 10 | 2 |
| 11 | 2 |
| 12 | 2 |

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 0 2 4 5 3 **11** 9 12 10 6 7 8

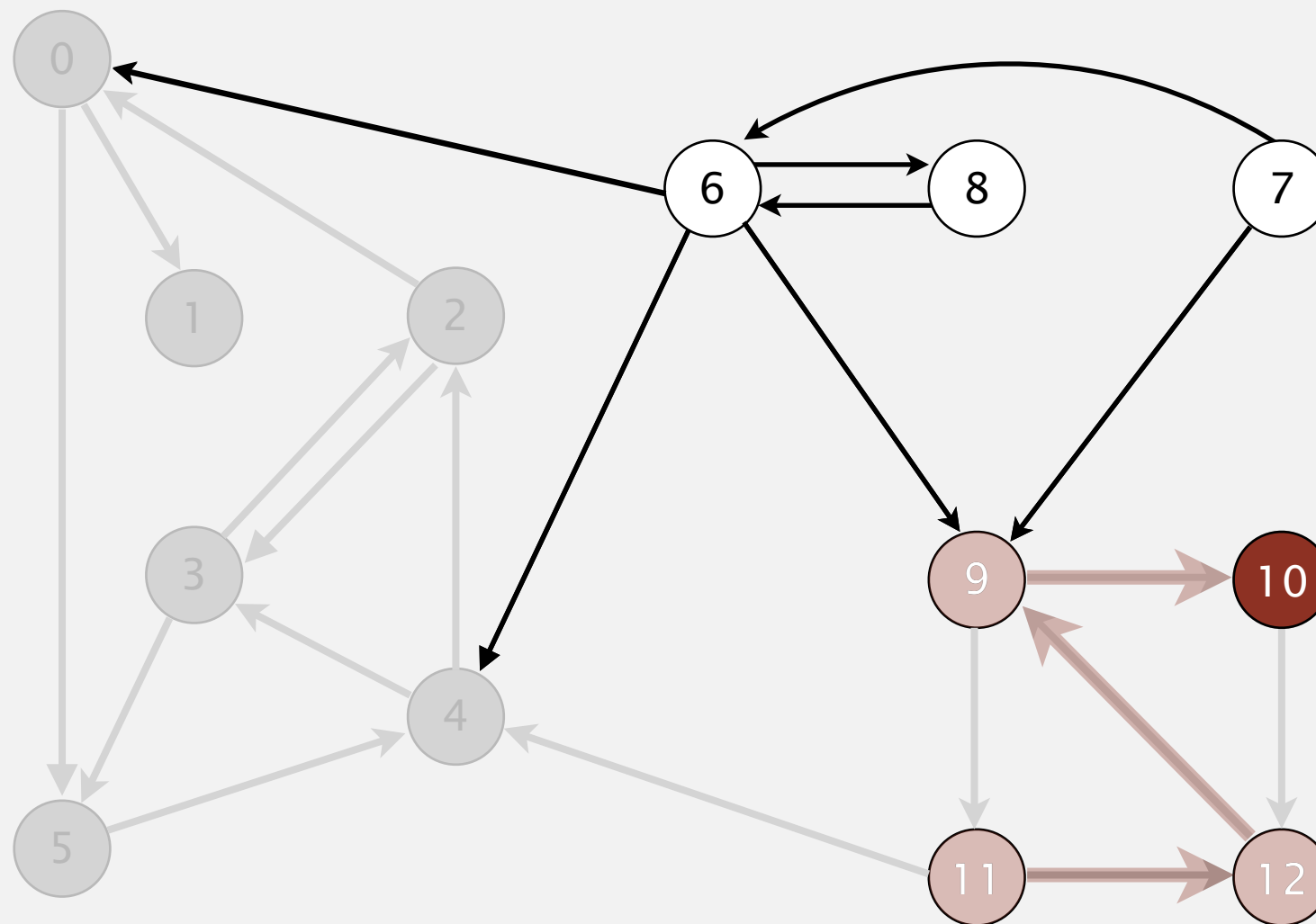


visit 10

| v | scc[v] |
|----------|---------------|
| 0 | 1 |
| 1 | 0 |
| 2 | 1 |
| 3 | 1 |
| 4 | 1 |
| 5 | 1 |
| 6 | - |
| 7 | - |
| 8 | - |
| 9 | 2 |
| 10 | 2 |
| 11 | 2 |
| 12 | 2 |

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 0 2 4 5 3 **11** 9 12 10 6 7 8

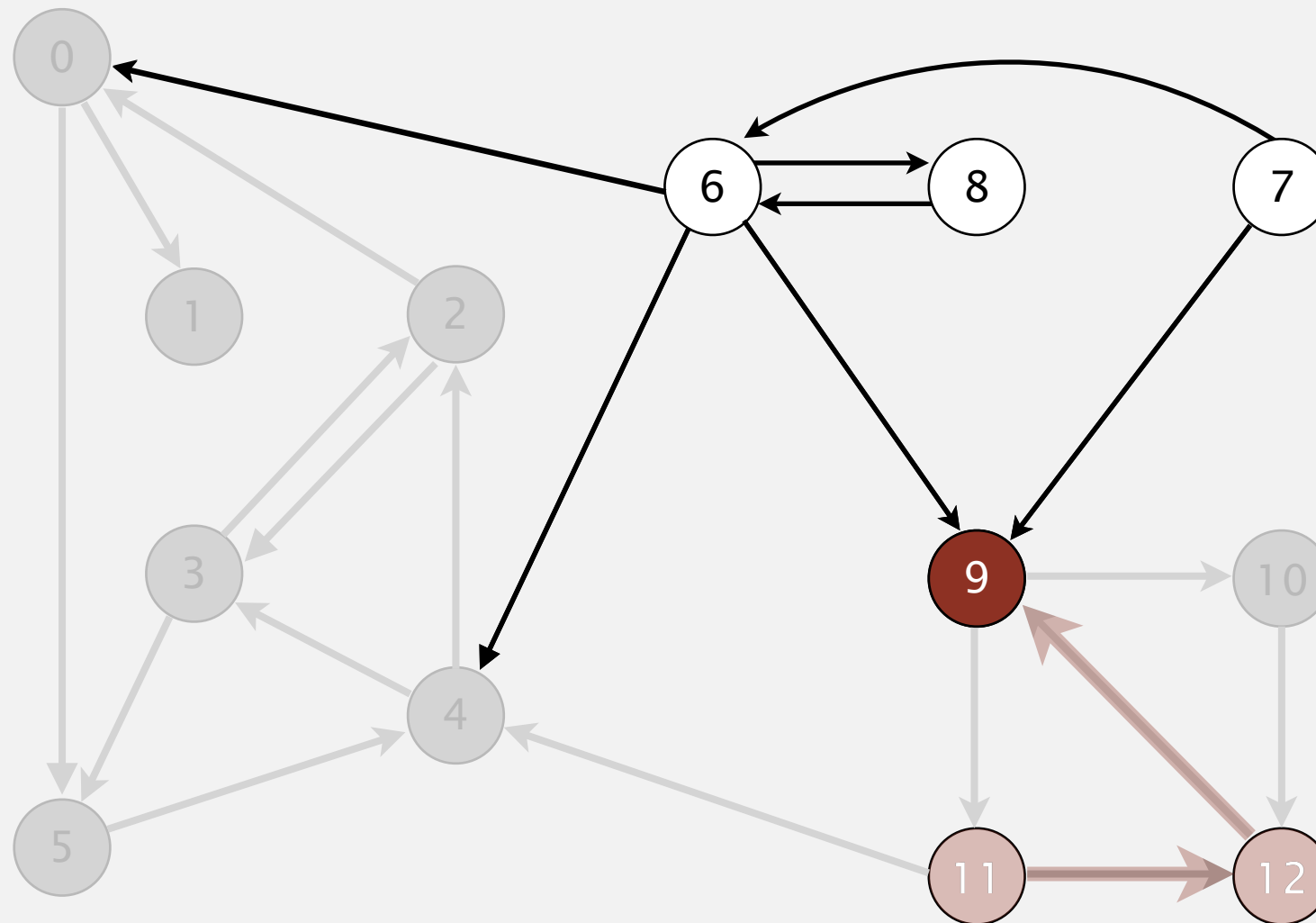


| v | scc[v] |
|----------|---------------|
| 0 | 1 |
| 1 | 0 |
| 2 | 1 |
| 3 | 1 |
| 4 | 1 |
| 5 | 1 |
| 6 | - |
| 7 | - |
| 8 | - |
| 9 | 2 |
| 10 | 2 |
| 11 | 2 |
| 12 | 2 |

10 done

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 0 2 4 5 3 **11** 9 12 10 6 7 8

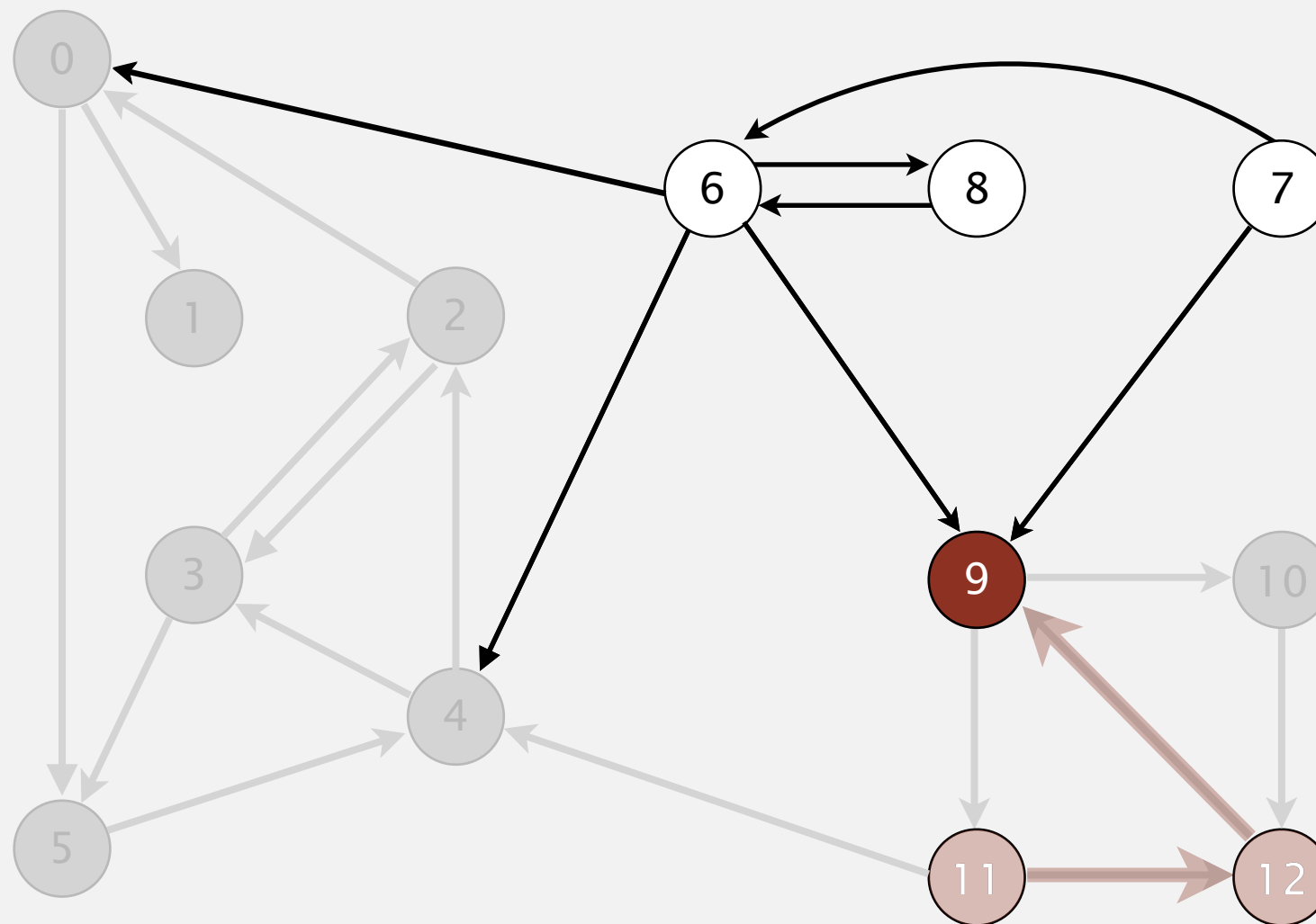


10 done

| v | scc[v] |
|----|--------|
| 0 | 1 |
| 1 | 0 |
| 2 | 1 |
| 3 | 1 |
| 4 | 1 |
| 5 | 1 |
| 6 | - |
| 7 | - |
| 8 | - |
| 9 | 2 |
| 10 | 2 |
| 11 | 2 |
| 12 | 2 |

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 0 2 4 5 3 **11** 9 12 10 6 7 8

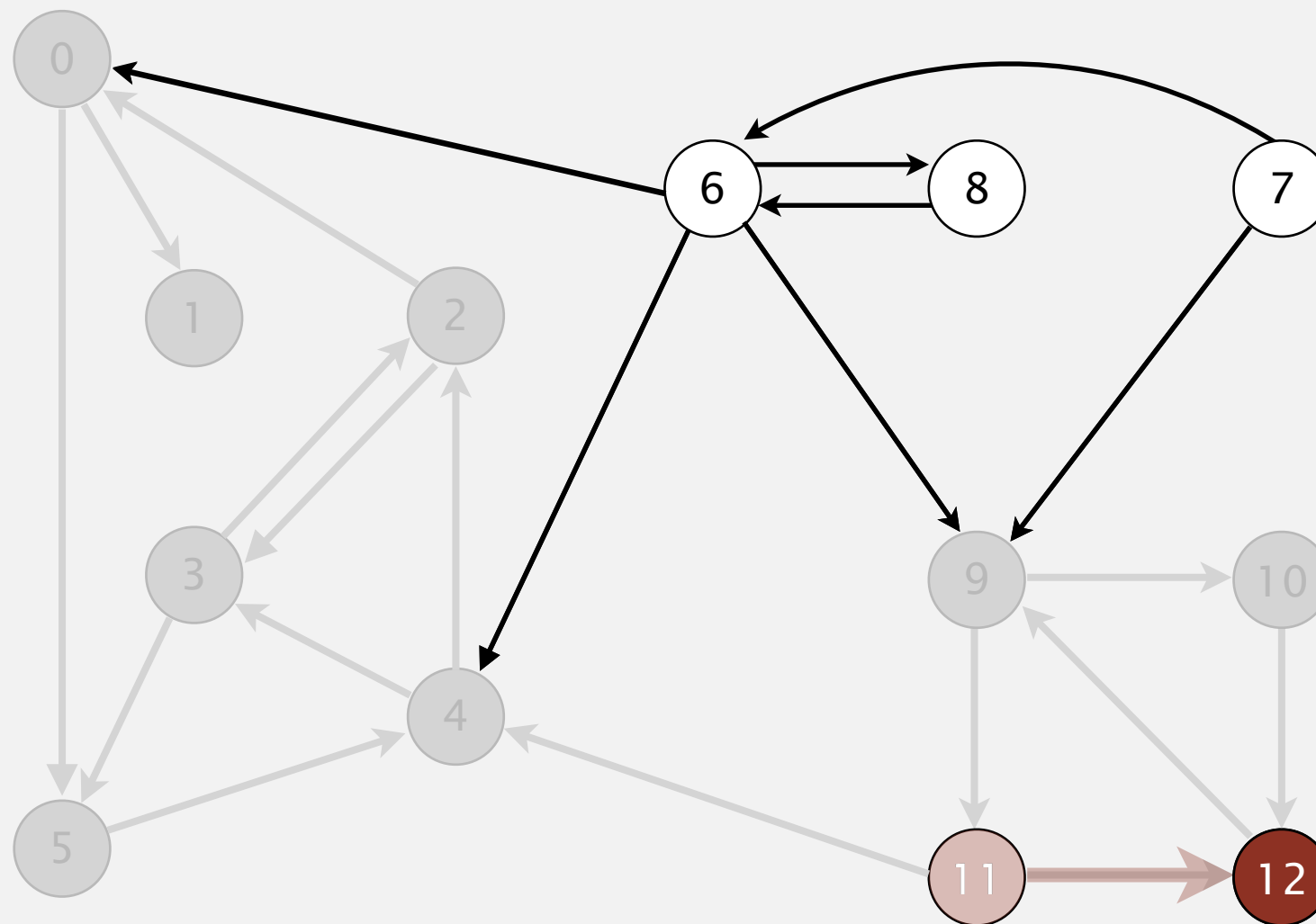


9 done

| v | scc[v] |
|----|--------|
| 0 | 1 |
| 1 | 0 |
| 2 | 1 |
| 3 | 1 |
| 4 | 1 |
| 5 | 1 |
| 6 | - |
| 7 | - |
| 8 | - |
| 9 | 2 |
| 10 | 2 |
| 11 | 2 |
| 12 | 2 |

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 0 2 4 5 3 **11** 9 12 10 6 7 8

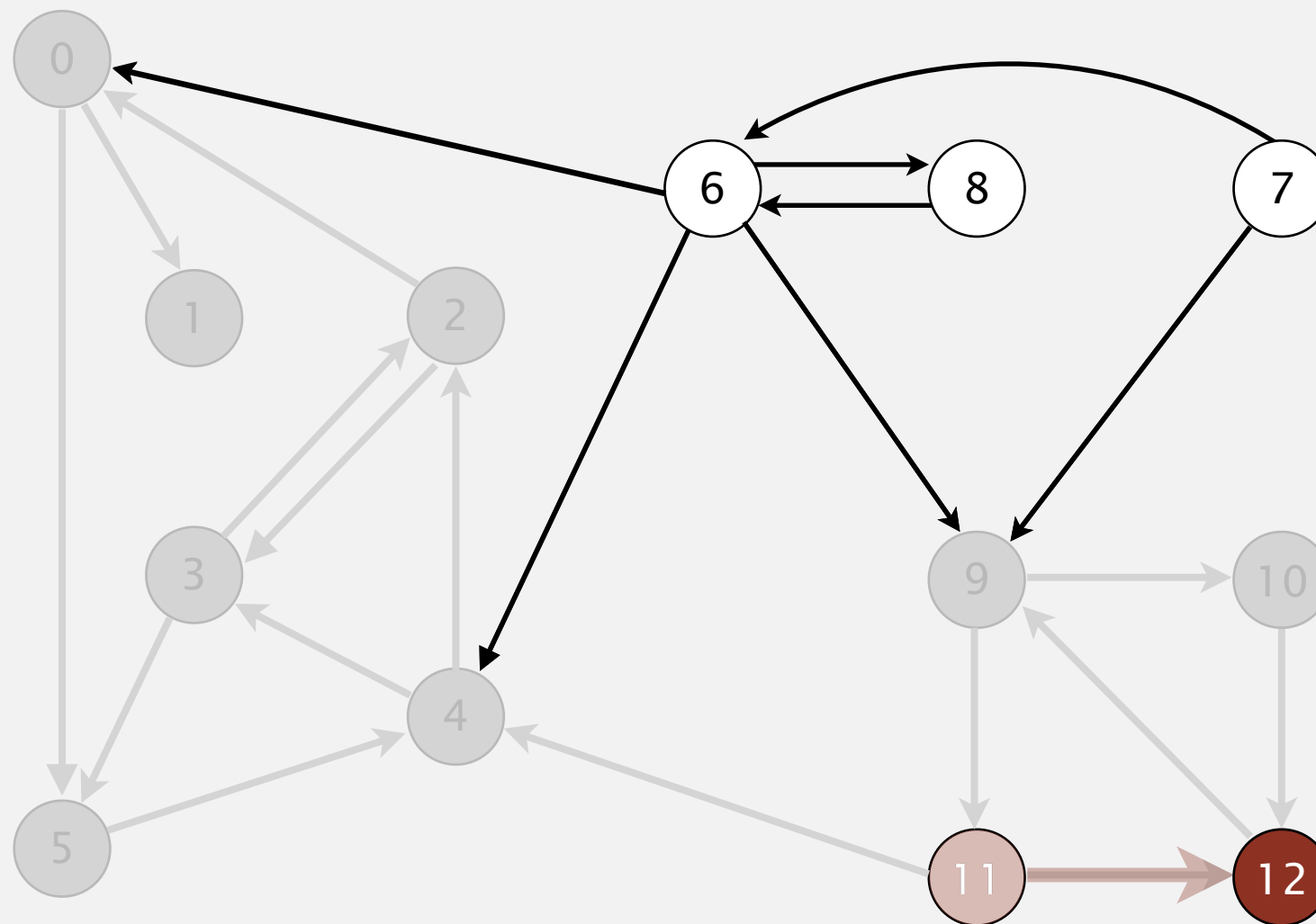


9 done

| v | scc[v] |
|----------|---------------|
| 0 | 1 |
| 1 | 0 |
| 2 | 1 |
| 3 | 1 |
| 4 | 1 |
| 5 | 1 |
| 6 | - |
| 7 | - |
| 8 | - |
| 9 | 2 |
| 10 | 2 |
| 11 | 2 |
| 12 | 2 |

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 0 2 4 5 3 **11** 9 12 10 6 7 8

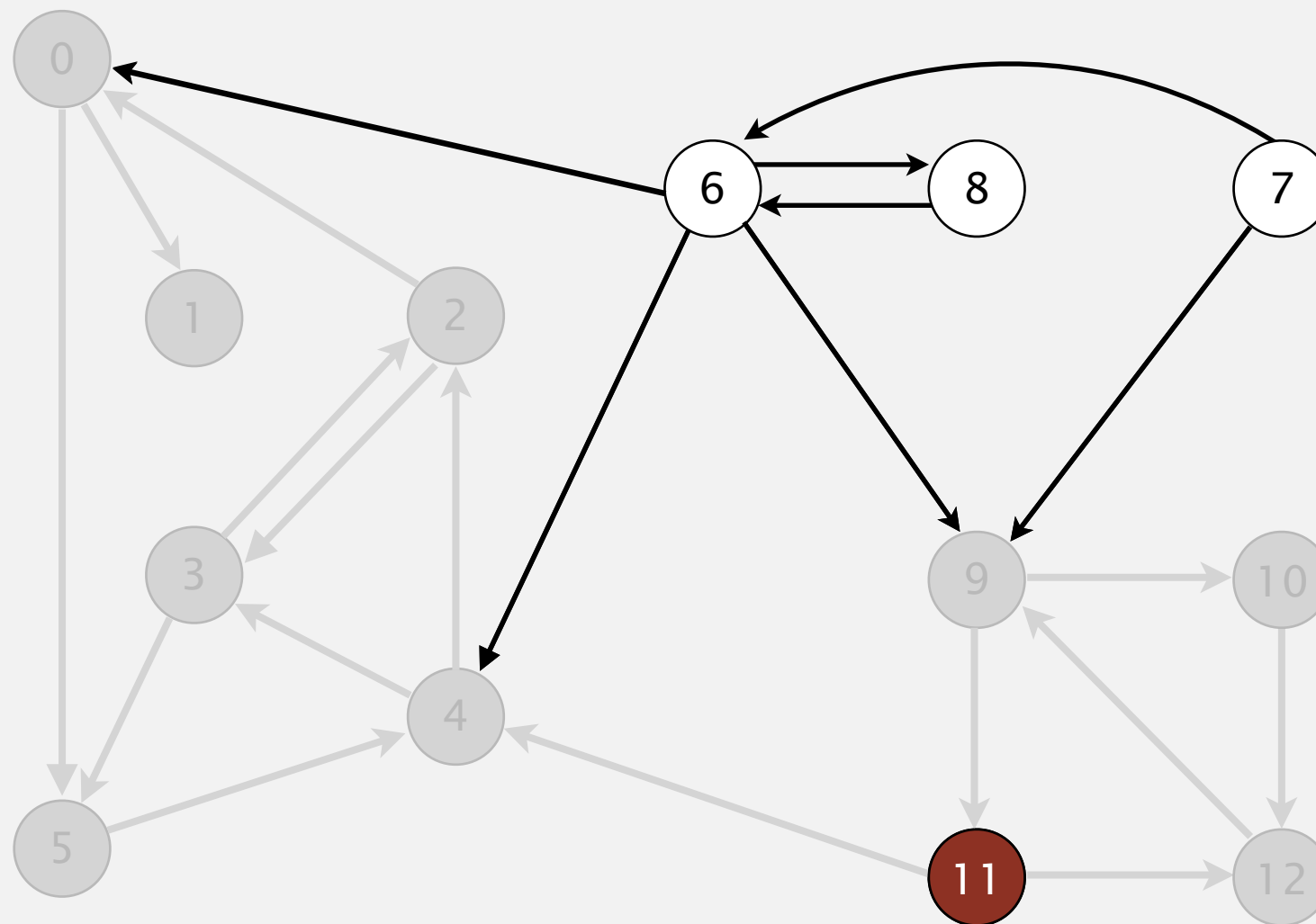


12 done

| v | scc[v] |
|----------|---------------|
| 0 | 1 |
| 1 | 0 |
| 2 | 1 |
| 3 | 1 |
| 4 | 1 |
| 5 | 1 |
| 6 | - |
| 7 | - |
| 8 | - |
| 9 | 2 |
| 10 | 2 |
| 11 | 2 |
| 12 | 2 |

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 0 2 4 5 3 **11** 9 12 10 6 7 8

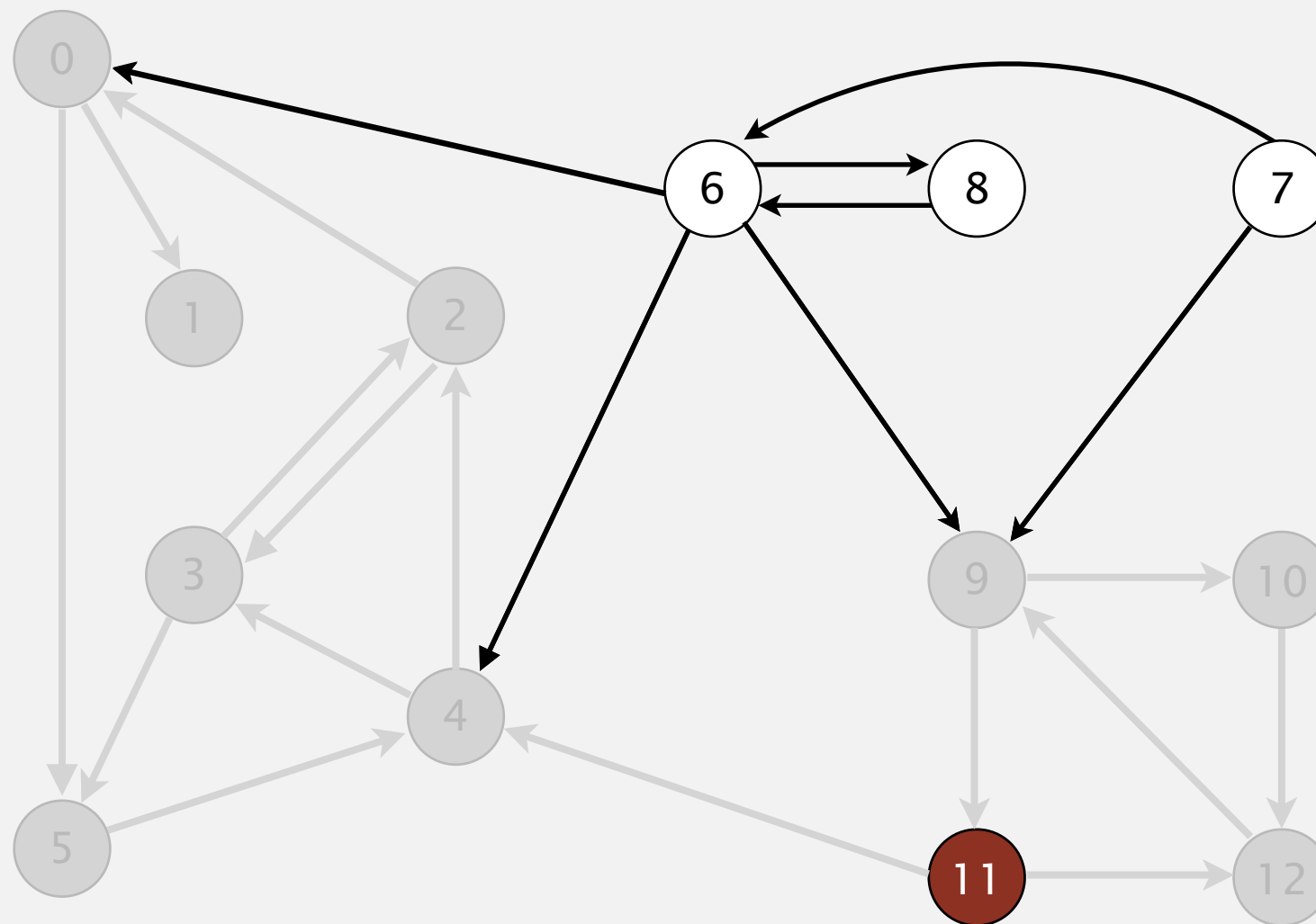


12 done

| v | scc[v] |
|----------|---------------|
| 0 | 1 |
| 1 | 0 |
| 2 | 1 |
| 3 | 1 |
| 4 | 1 |
| 5 | 1 |
| 6 | - |
| 7 | - |
| 8 | - |
| 9 | 2 |
| 10 | 2 |
| 11 | 2 |
| 12 | 2 |

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 0 2 4 5 3 **11** 9 12 10 6 7 8

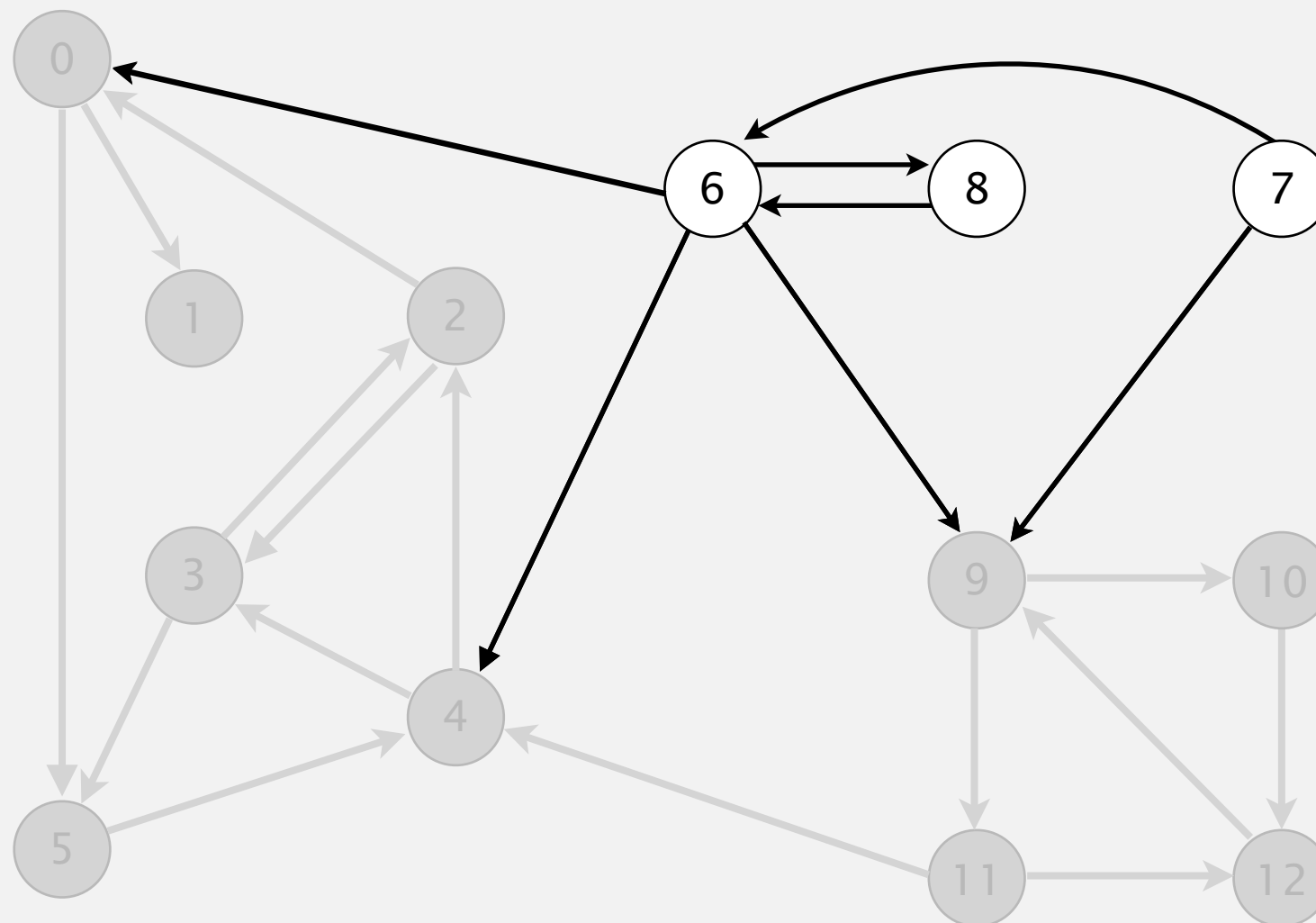


11 done

| v | scc[v] |
|----------|---------------|
| 0 | 1 |
| 1 | 0 |
| 2 | 1 |
| 3 | 1 |
| 4 | 1 |
| 5 | 1 |
| 6 | - |
| 7 | - |
| 8 | - |
| 9 | 2 |
| 10 | 2 |
| 11 | 2 |
| 12 | 2 |

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 0 2 4 5 3 **11** 9 12 10 6 7 8

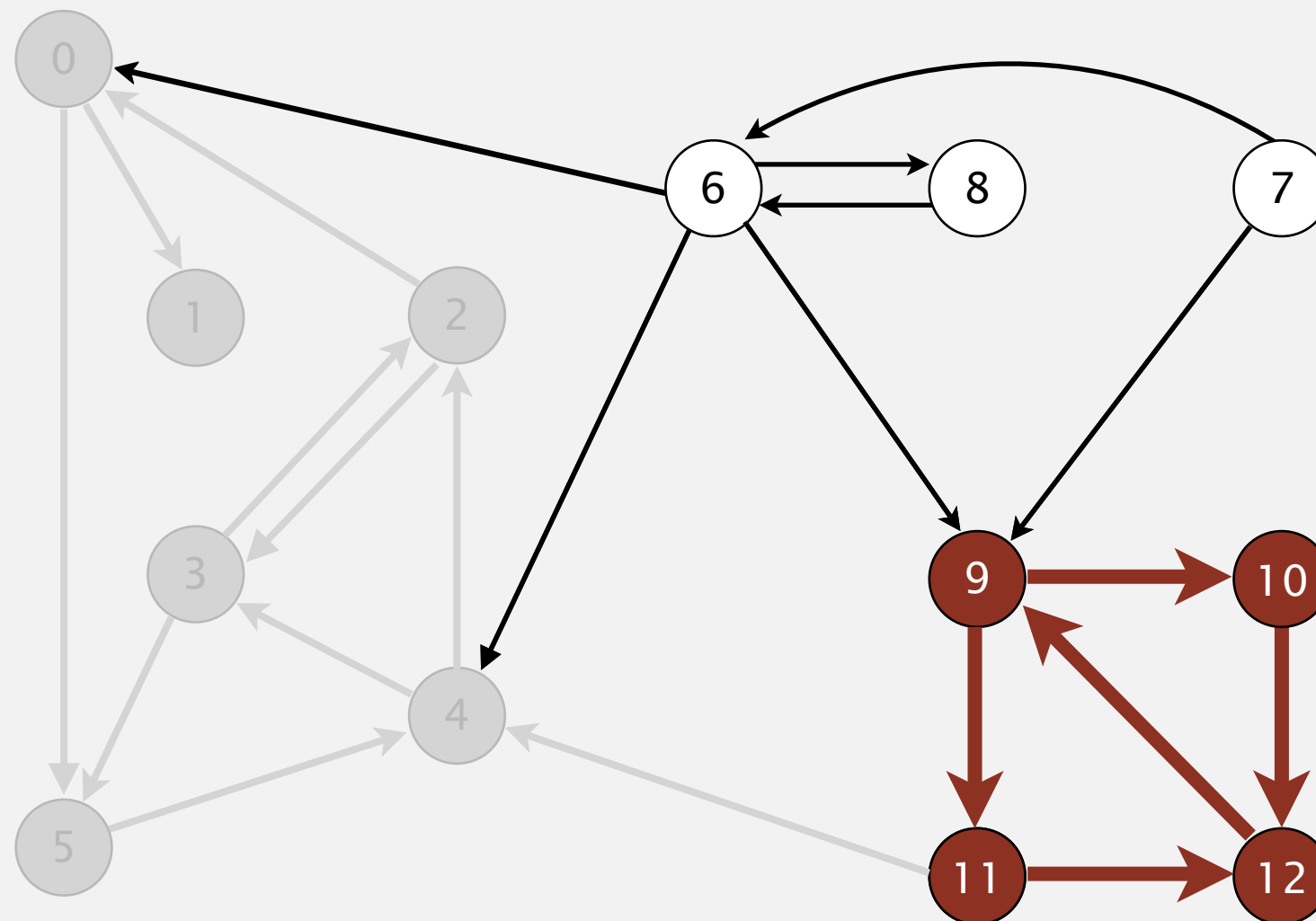


11 done

| v | scc[v] |
|----------|---------------|
| 0 | 1 |
| 1 | 0 |
| 2 | 1 |
| 3 | 1 |
| 4 | 1 |
| 5 | 1 |
| 6 | - |
| 7 | - |
| 8 | - |
| 9 | 2 |
| 10 | 2 |
| 11 | 2 |
| 12 | 2 |

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 0 2 4 5 3 **11** 9 12 10 6 7 8

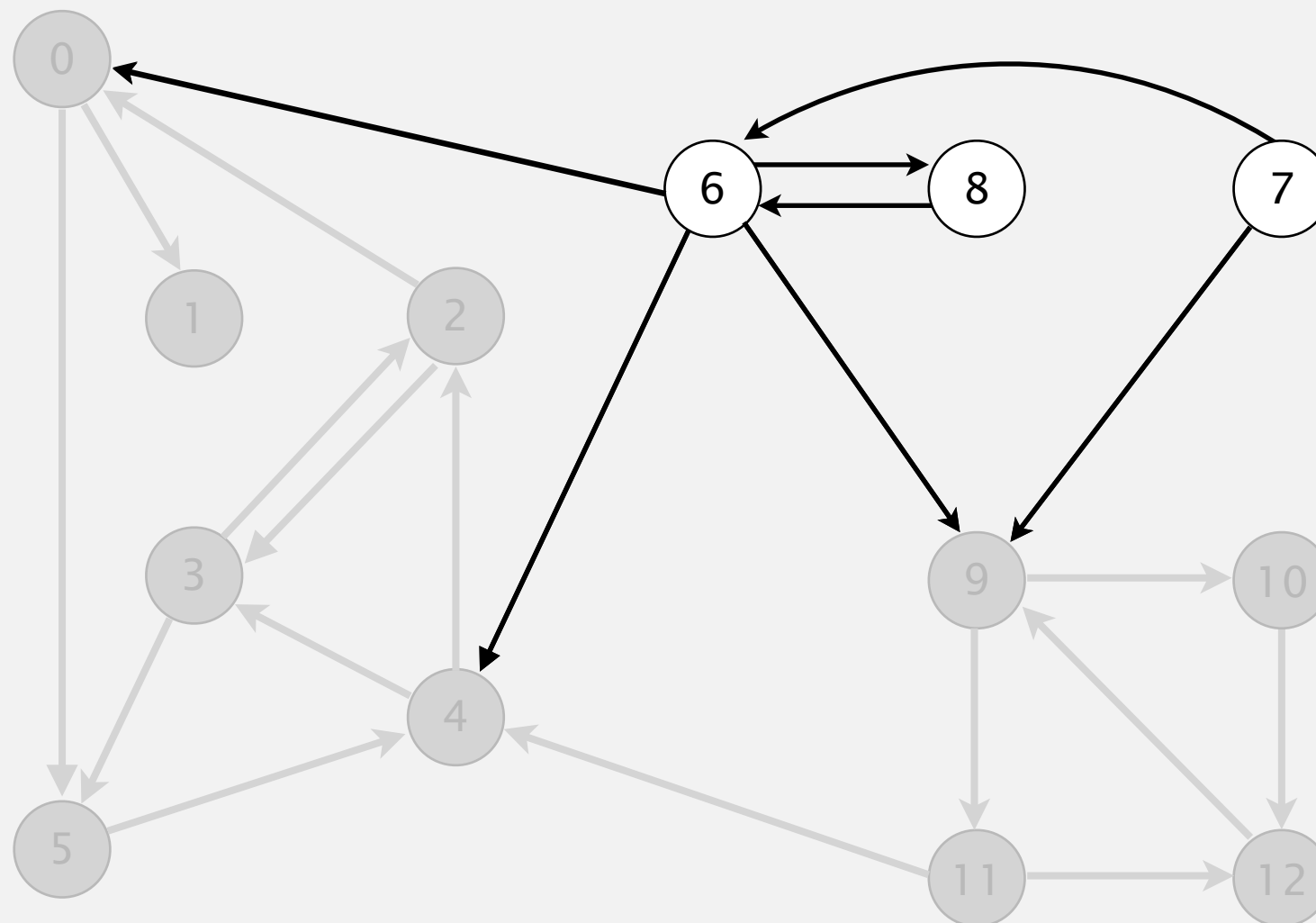


strong component: 9 10 11 12

| v | scc[v] |
|----------|---------------|
| 0 | 1 |
| 1 | 0 |
| 2 | 1 |
| 3 | 1 |
| 4 | 1 |
| 5 | 1 |
| 6 | - |
| 7 | - |
| 8 | - |
| 9 | 2 |
| 10 | 2 |
| 11 | 2 |
| 12 | 2 |

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 0 2 4 5 3 11 **9** 12 10 6 7 8

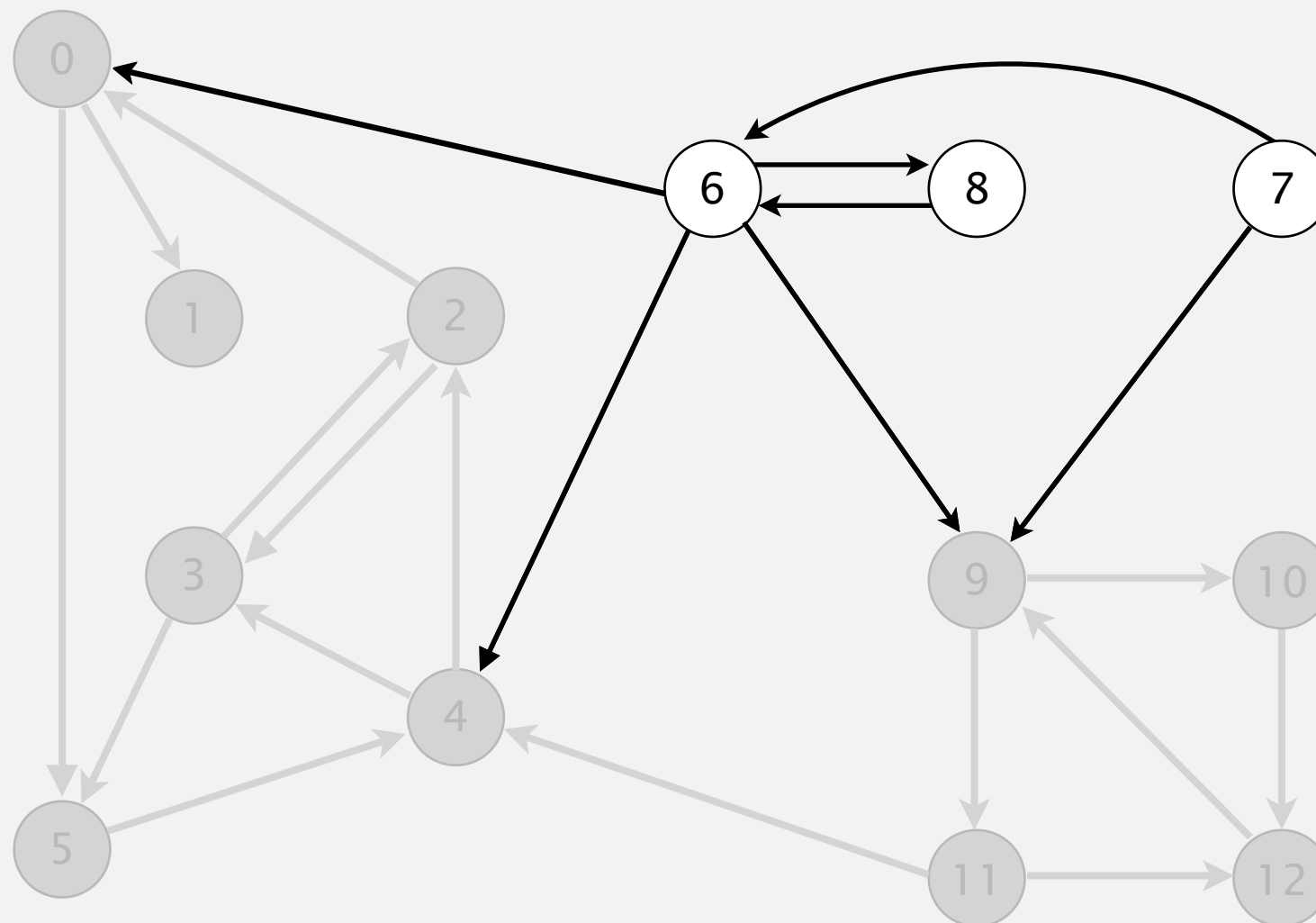


check 9

| v | scc[v] |
|----|--------|
| 0 | 1 |
| 1 | 0 |
| 2 | 1 |
| 3 | 1 |
| 4 | 1 |
| 5 | 1 |
| 6 | - |
| 7 | - |
| 8 | - |
| 9 | 2 |
| 10 | 2 |
| 11 | 2 |
| 12 | 2 |

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 0 2 4 5 3 11 9 **12** 10 6 7 8

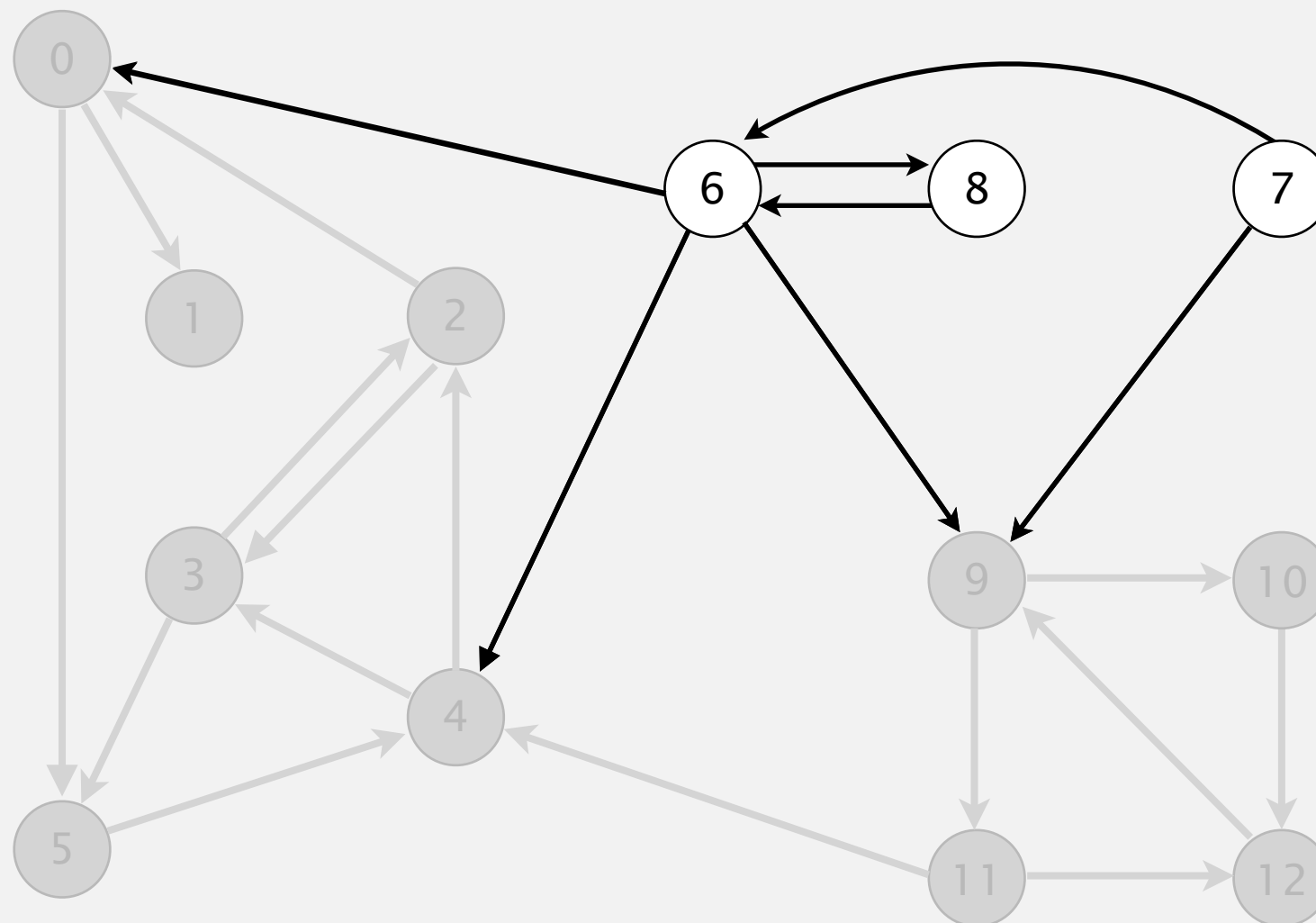


check 12

| v | scc[v] |
|----------|---------------|
| 0 | 1 |
| 1 | 0 |
| 2 | 1 |
| 3 | 1 |
| 4 | 1 |
| 5 | 1 |
| 6 | - |
| 7 | - |
| 8 | - |
| 9 | 2 |
| 10 | 2 |
| 11 | 2 |
| 12 | 2 |

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 0 2 4 5 3 11 9 12 **10** 6 7 8

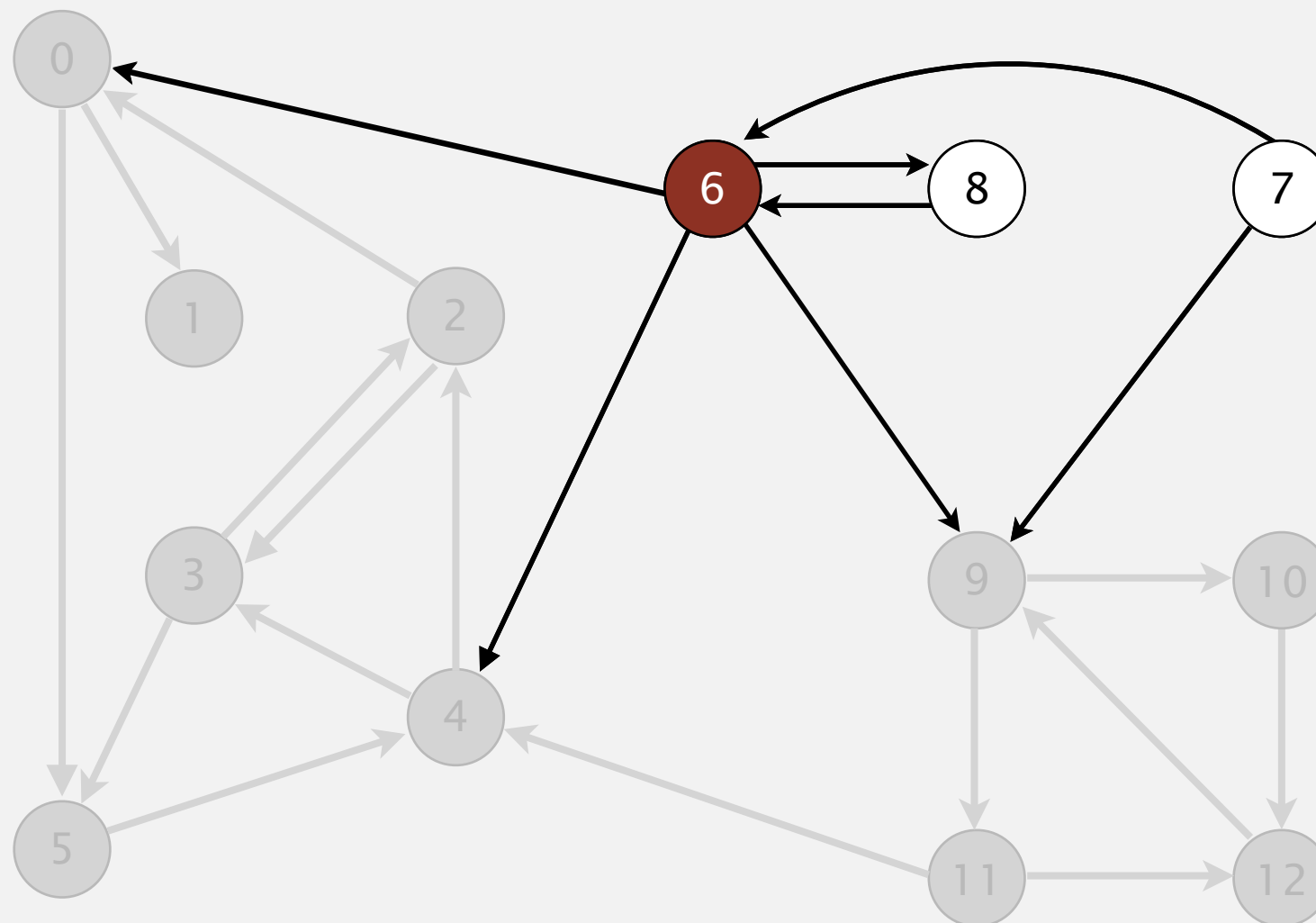


check 10

| v | scc[v] |
|----------|---------------|
| 0 | 1 |
| 1 | 0 |
| 2 | 1 |
| 3 | 1 |
| 4 | 1 |
| 5 | 1 |
| 6 | - |
| 7 | - |
| 8 | - |
| 9 | 2 |
| 10 | 2 |
| 11 | 2 |
| 12 | 2 |

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 0 2 4 5 3 11 9 12 10 **6** 7 8

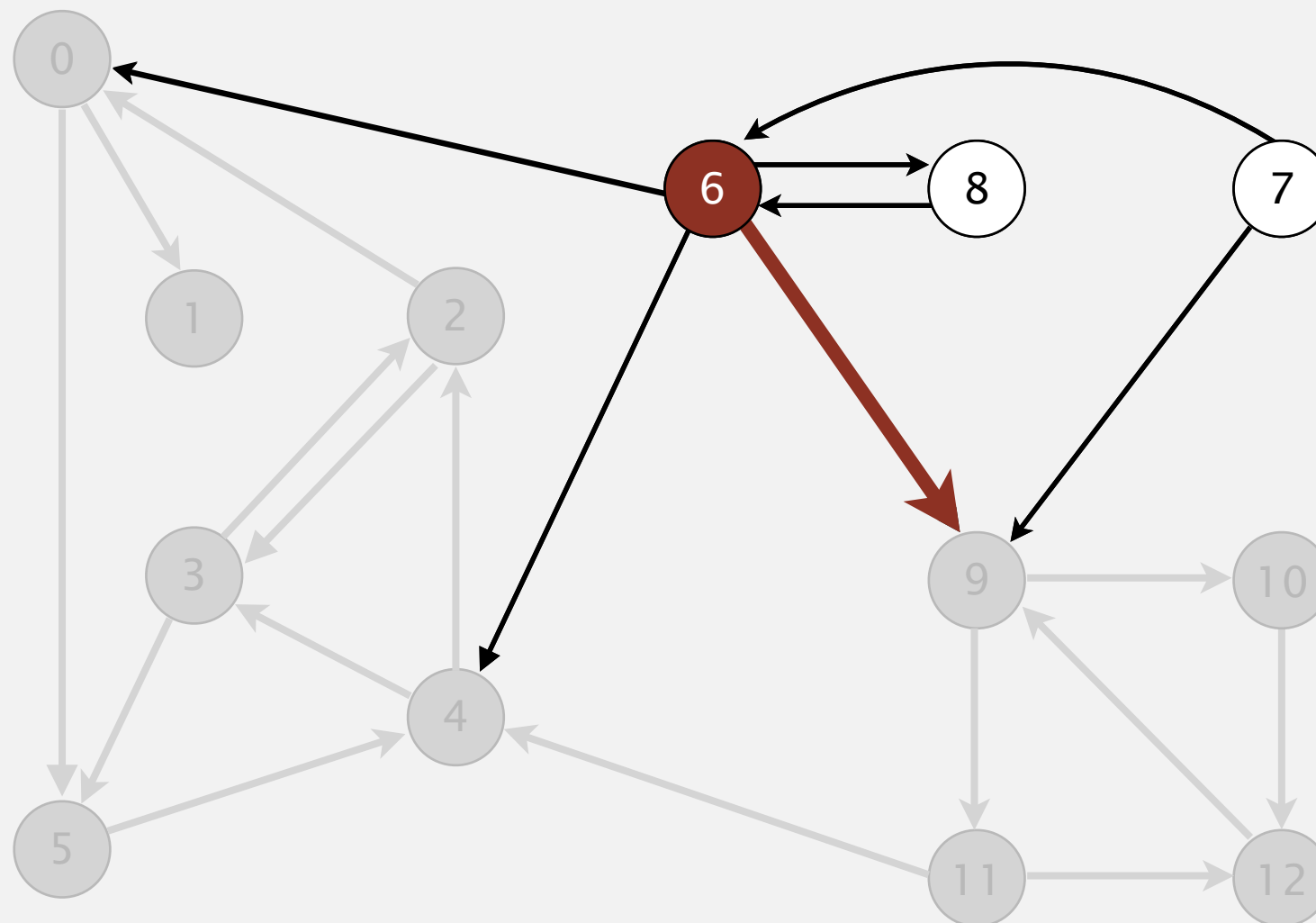


visit 6

| v | scc[v] |
|----|--------|
| 0 | 1 |
| 1 | 0 |
| 2 | 1 |
| 3 | 1 |
| 4 | 1 |
| 5 | 1 |
| 6 | 3 |
| 7 | - |
| 8 | - |
| 9 | 2 |
| 10 | 2 |
| 11 | 2 |
| 12 | 2 |

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 0 2 4 5 3 11 9 12 10 **6** 7 8

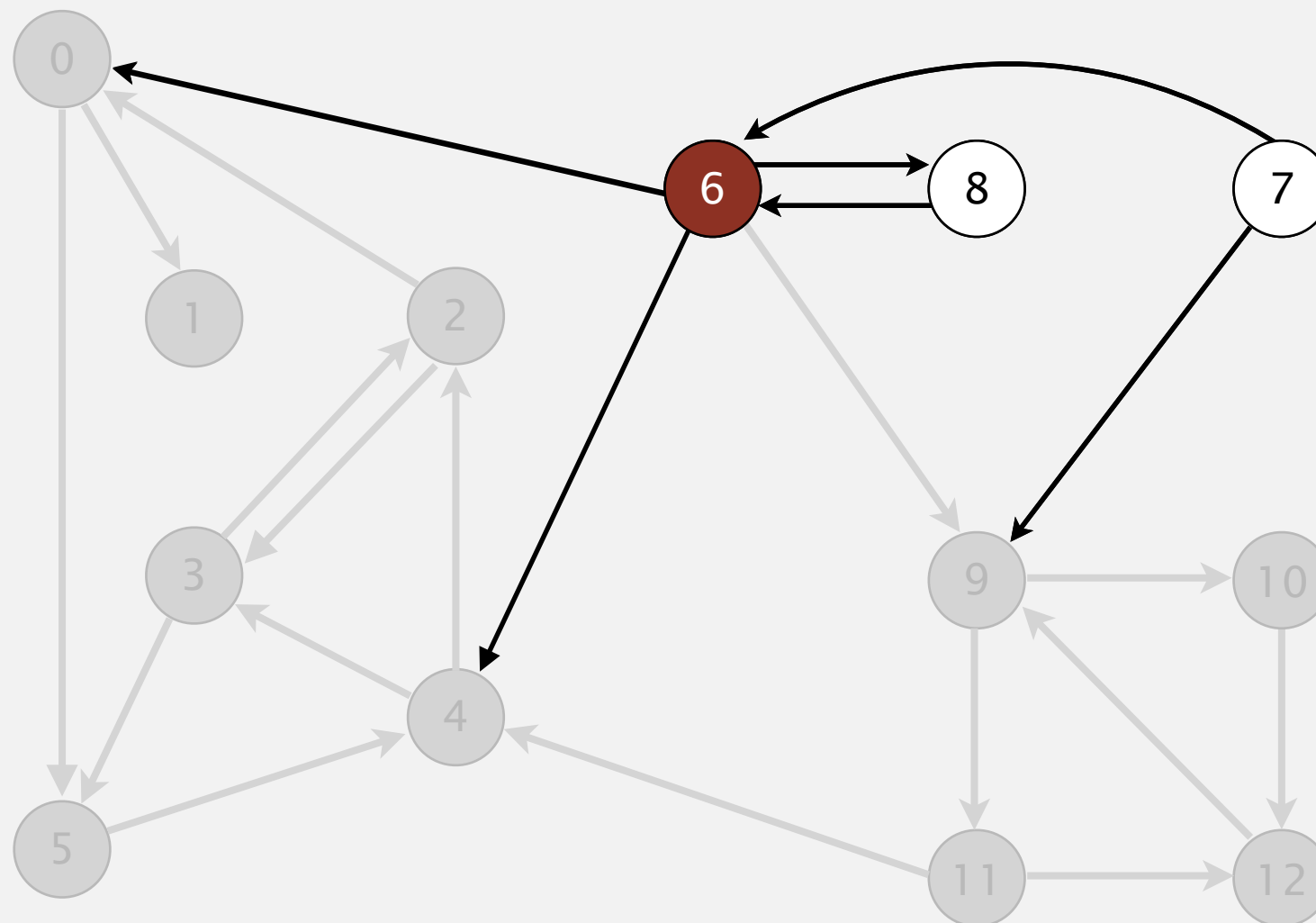


visit 6

| v | $scc[v]$ |
|-----|----------|
| 0 | 1 |
| 1 | 0 |
| 2 | 1 |
| 3 | 1 |
| 4 | 1 |
| 5 | 1 |
| 6 | 3 |
| 7 | - |
| 8 | - |
| 9 | 2 |
| 10 | 2 |
| 11 | 2 |
| 12 | 2 |

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 0 2 4 5 3 11 9 12 10 **6** 7 8

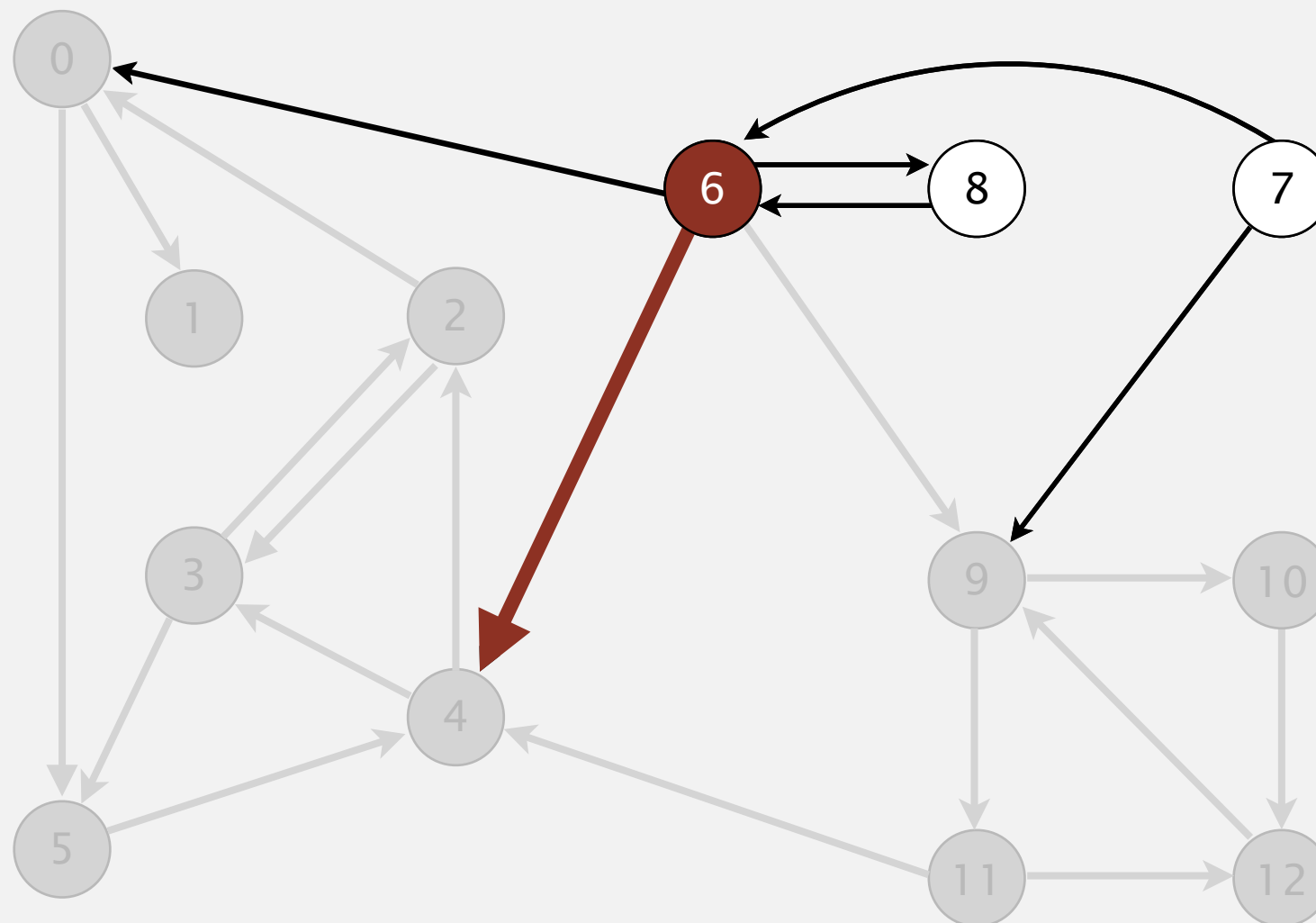


visit 6

| v | scc[v] |
|----|--------|
| 0 | 1 |
| 1 | 0 |
| 2 | 1 |
| 3 | 1 |
| 4 | 1 |
| 5 | 1 |
| 6 | 3 |
| 7 | - |
| 8 | - |
| 9 | 2 |
| 10 | 2 |
| 11 | 2 |
| 12 | 2 |

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 0 2 4 5 3 11 9 12 10 **6** 7 8

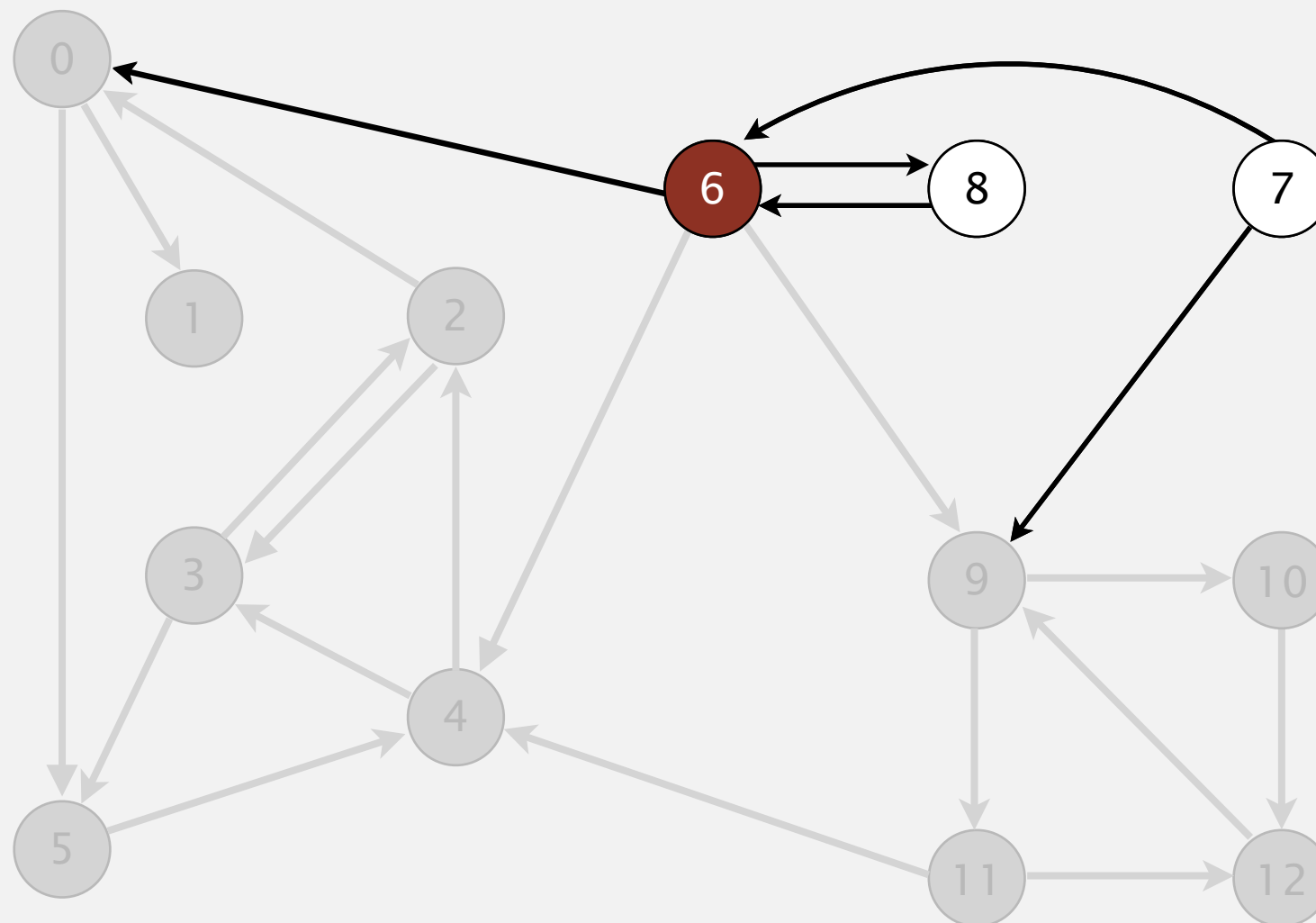


visit 6

| v | scc[v] |
|----|--------|
| 0 | 1 |
| 1 | 0 |
| 2 | 1 |
| 3 | 1 |
| 4 | 1 |
| 5 | 1 |
| 6 | 3 |
| 7 | - |
| 8 | - |
| 9 | 2 |
| 10 | 2 |
| 11 | 2 |
| 12 | 2 |

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 0 2 4 5 3 11 9 12 10 **6** 7 8

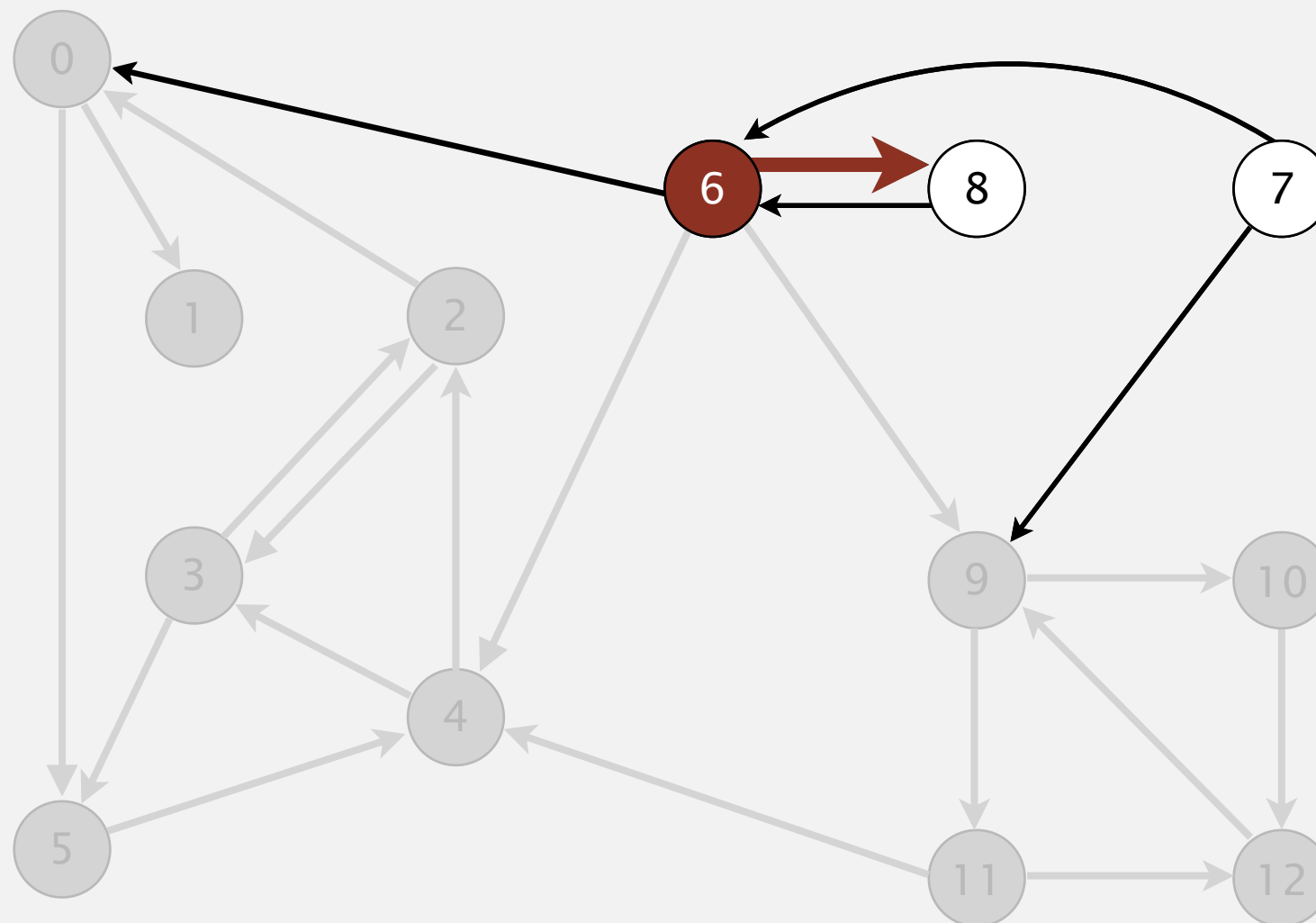


visit 6

| v | scc[v] |
|----------|---------------|
| 0 | 1 |
| 1 | 0 |
| 2 | 1 |
| 3 | 1 |
| 4 | 1 |
| 5 | 1 |
| 6 | 3 |
| 7 | - |
| 8 | - |
| 9 | 2 |
| 10 | 2 |
| 11 | 2 |
| 12 | 2 |

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 0 2 4 5 3 11 9 12 10 **6** 7 8

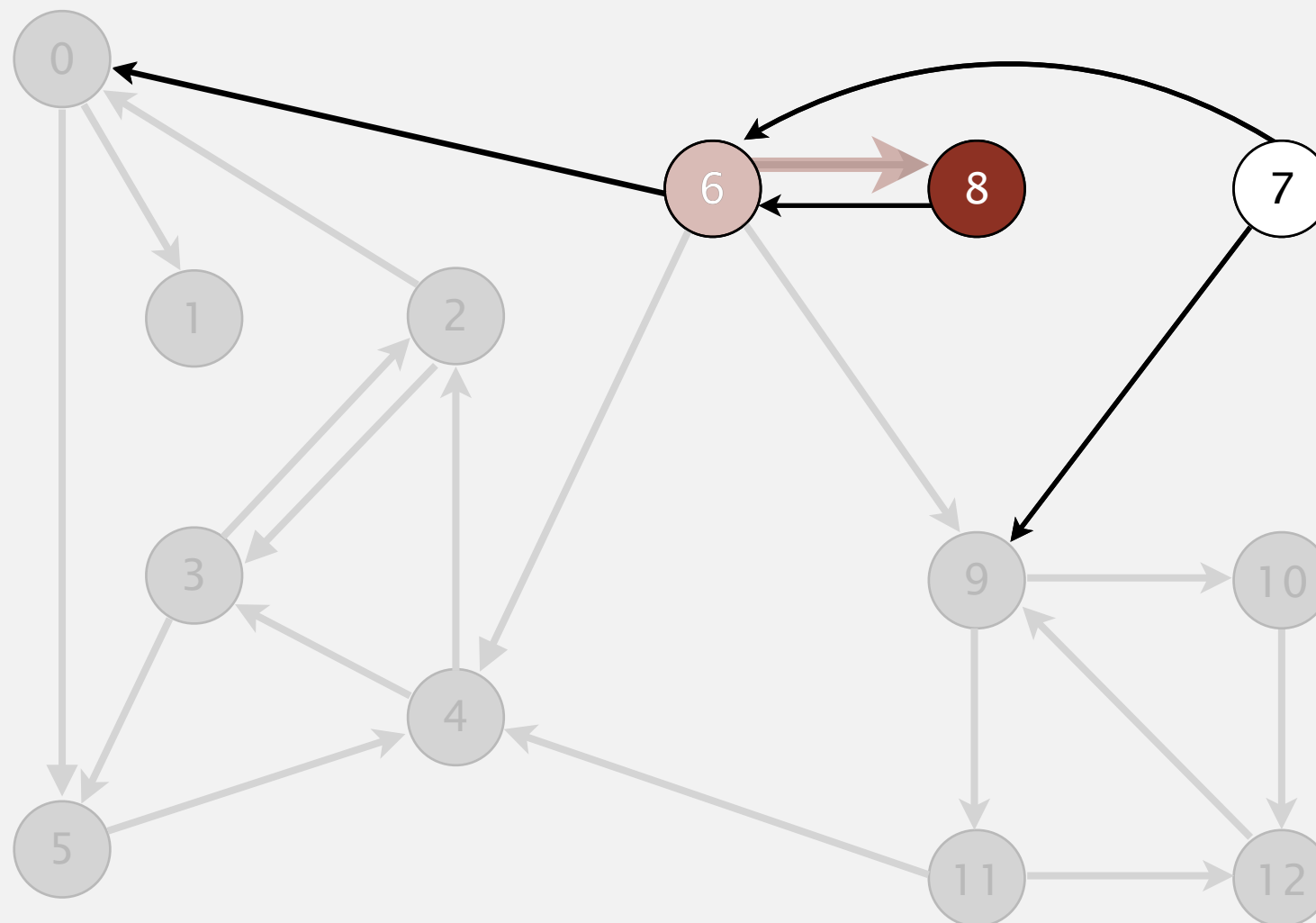


visit 6

| v | scc[v] |
|----------|---------------|
| 0 | 1 |
| 1 | 0 |
| 2 | 1 |
| 3 | 1 |
| 4 | 1 |
| 5 | 1 |
| 6 | 3 |
| 7 | - |
| 8 | - |
| 9 | 2 |
| 10 | 2 |
| 11 | 2 |
| 12 | 2 |

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 0 2 4 5 3 11 9 12 10 **6** 7 8

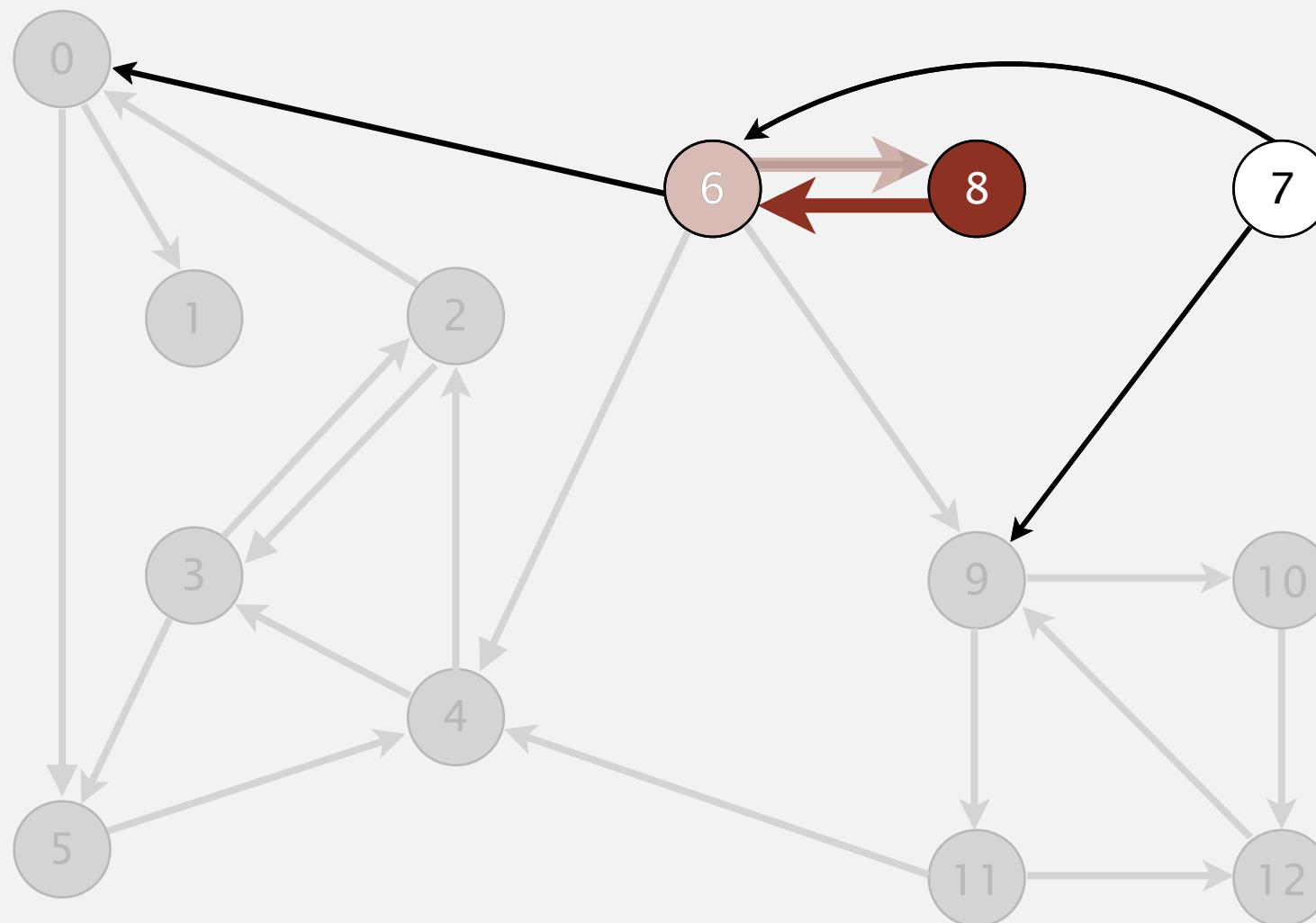


visit 8

| v | scc[v] |
|----------|---------------|
| 0 | 1 |
| 1 | 0 |
| 2 | 1 |
| 3 | 1 |
| 4 | 1 |
| 5 | 1 |
| 6 | 3 |
| 7 | — |
| 8 | 3 |
| 9 | 2 |
| 10 | 2 |
| 11 | 2 |
| 12 | 2 |

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 0 2 4 5 3 11 9 12 10 **6** 7 8

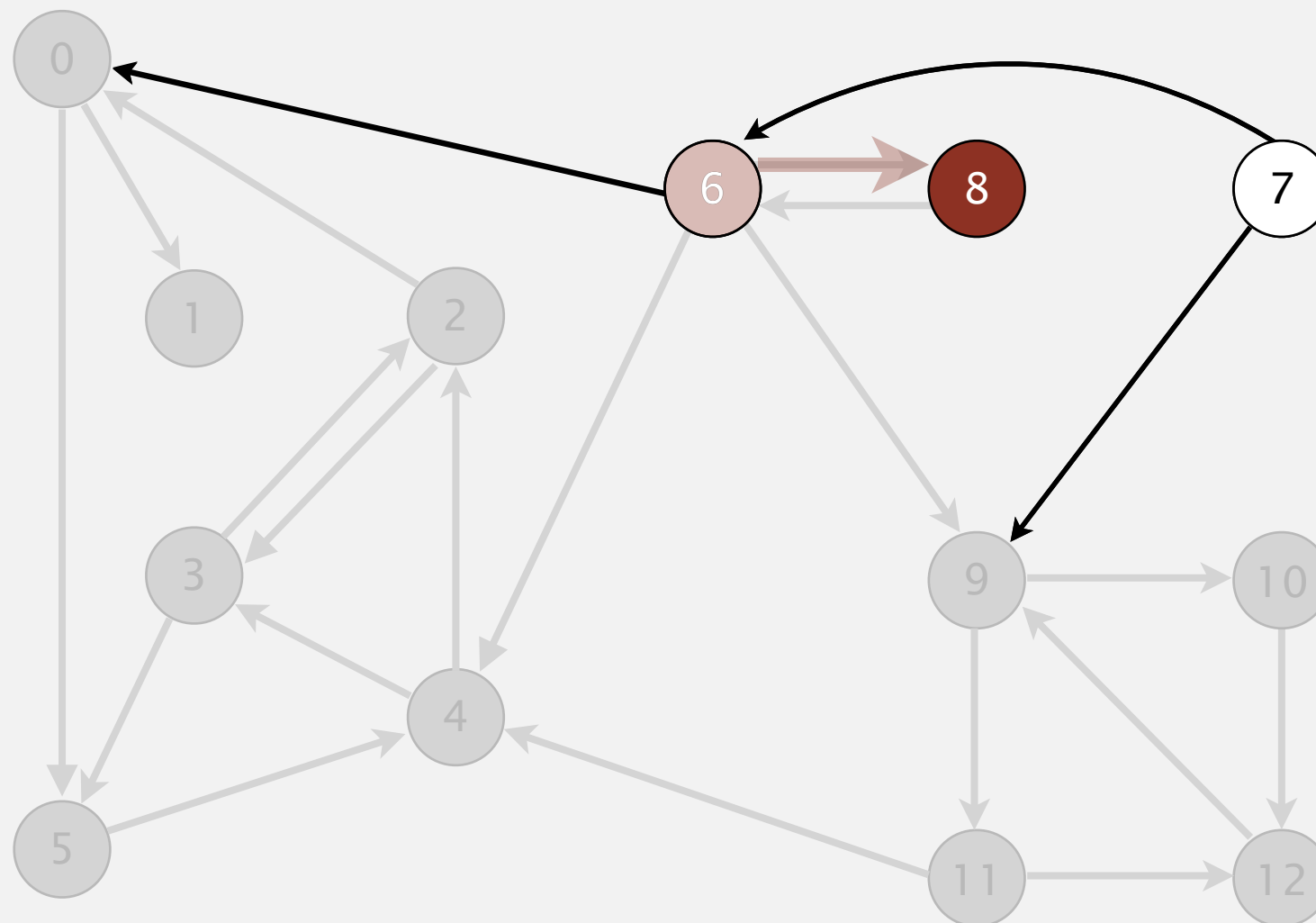


visit 8

| v | scc[v] |
|----------|---------------|
| 0 | 1 |
| 1 | 0 |
| 2 | 1 |
| 3 | 1 |
| 4 | 1 |
| 5 | 1 |
| 6 | 3 |
| 7 | — |
| 8 | 3 |
| 9 | 2 |
| 10 | 2 |
| 11 | 2 |
| 12 | 2 |

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 0 2 4 5 3 11 9 12 10 **6** 7 8

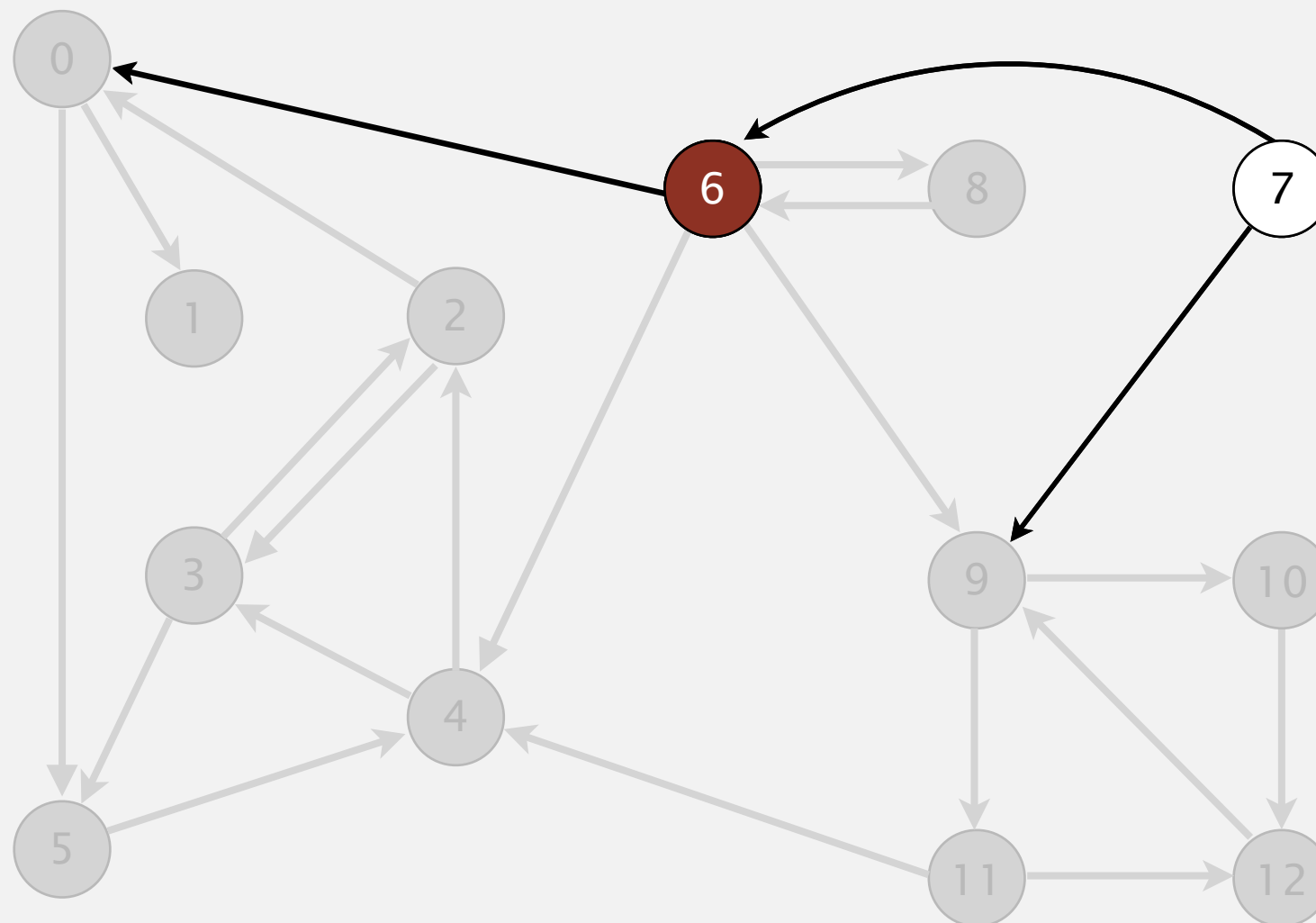


8 done

| v | scc[v] |
|----------|---------------|
| 0 | 1 |
| 1 | 0 |
| 2 | 1 |
| 3 | 1 |
| 4 | 1 |
| 5 | 1 |
| 6 | 3 |
| 7 | - |
| 8 | 3 |
| 9 | 2 |
| 10 | 2 |
| 11 | 2 |
| 12 | 2 |

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 0 2 4 5 3 11 9 12 10 **6** 7 8

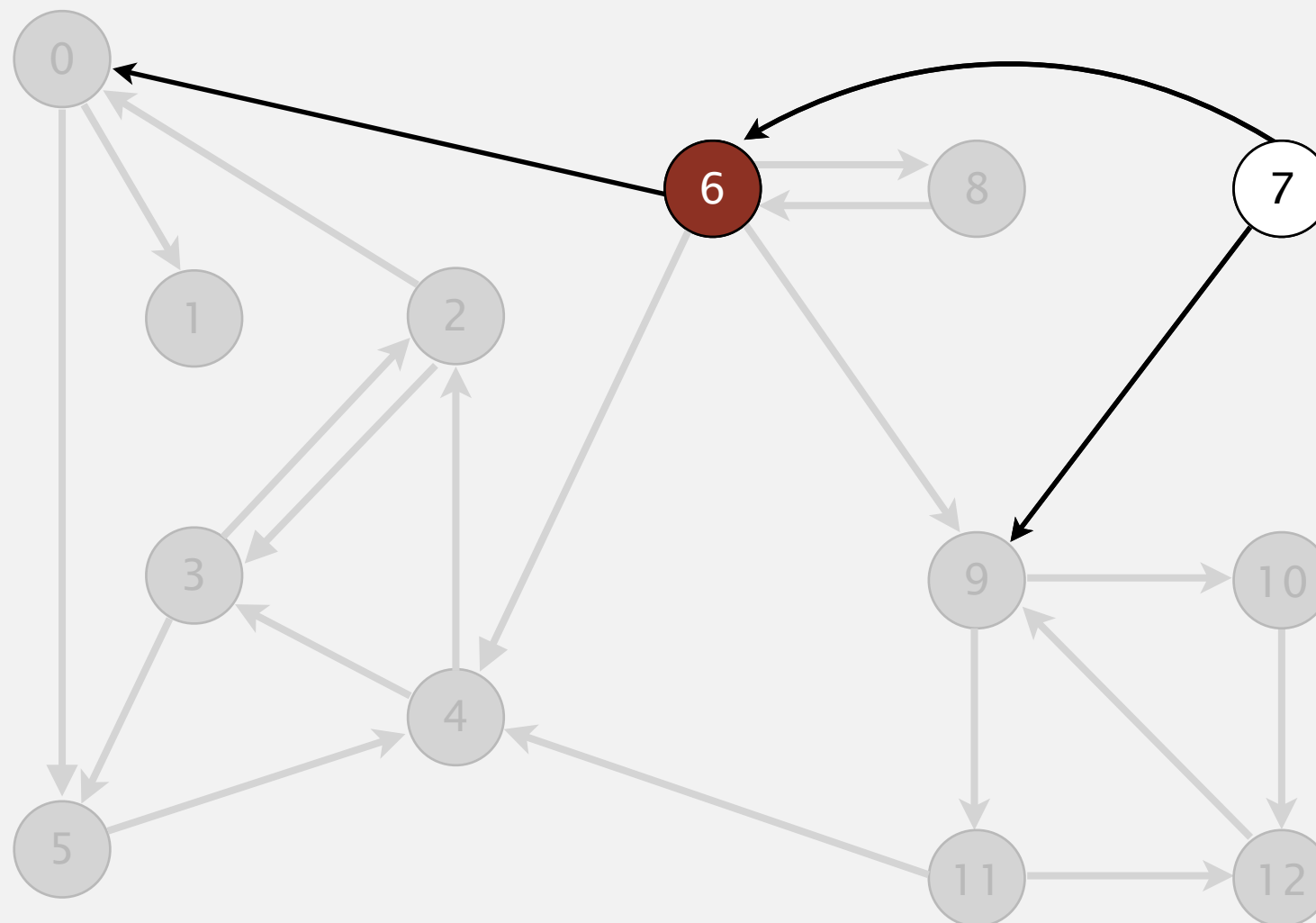


8 done

| v | scc[v] |
|----------|---------------|
| 0 | 1 |
| 1 | 0 |
| 2 | 1 |
| 3 | 1 |
| 4 | 1 |
| 5 | 1 |
| 6 | 3 |
| 7 | - |
| 8 | 3 |
| 9 | 2 |
| 10 | 2 |
| 11 | 2 |
| 12 | 2 |

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 0 2 4 5 3 11 9 12 10 **6** 7 8

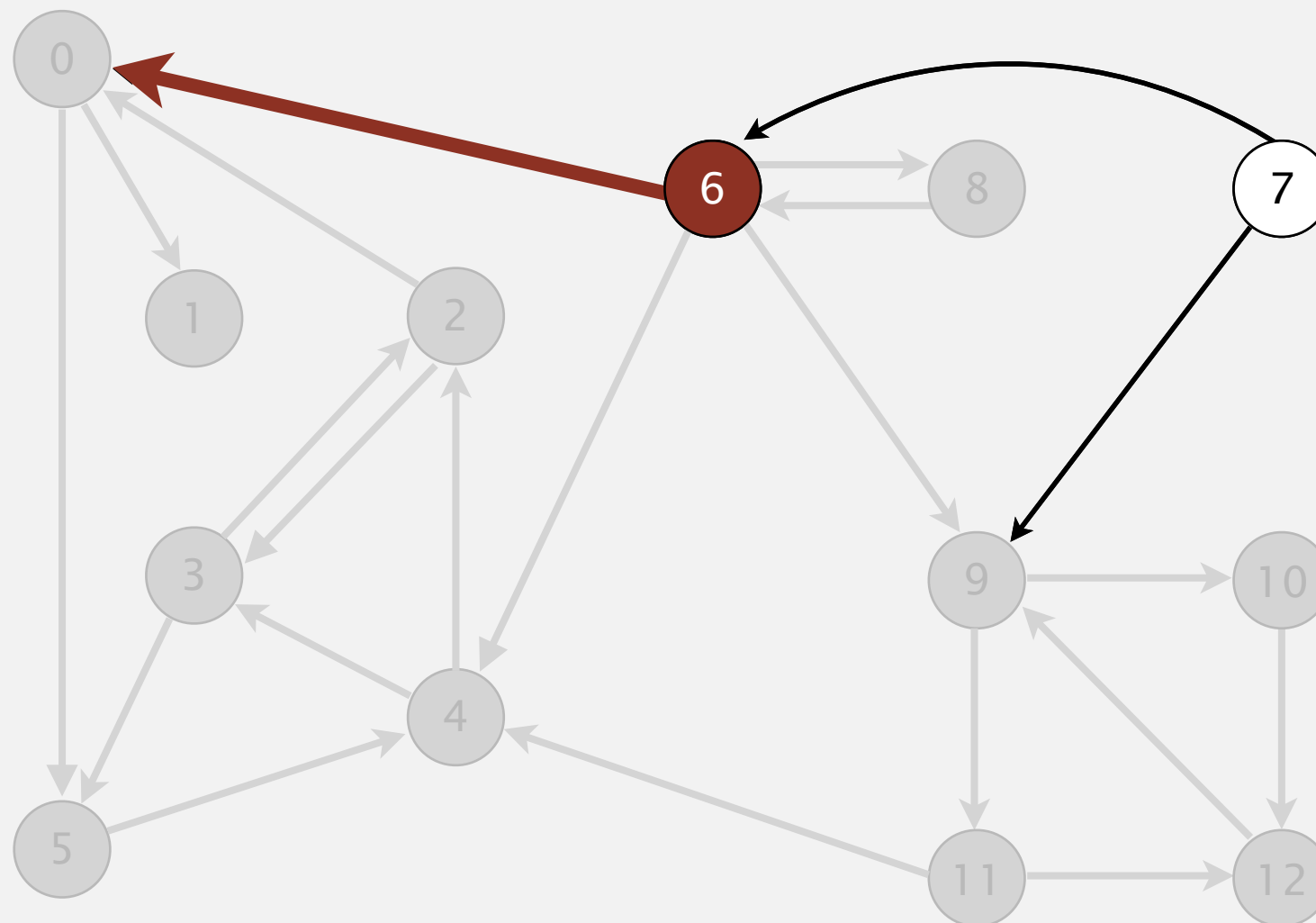


visit 6

| v | scc[v] |
|----------|---------------|
| 0 | 1 |
| 1 | 0 |
| 2 | 1 |
| 3 | 1 |
| 4 | 1 |
| 5 | 1 |
| 6 | 3 |
| 7 | - |
| 8 | 3 |
| 9 | 2 |
| 10 | 2 |
| 11 | 2 |
| 12 | 2 |

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 0 2 4 5 3 11 9 12 10 **6** 7 8

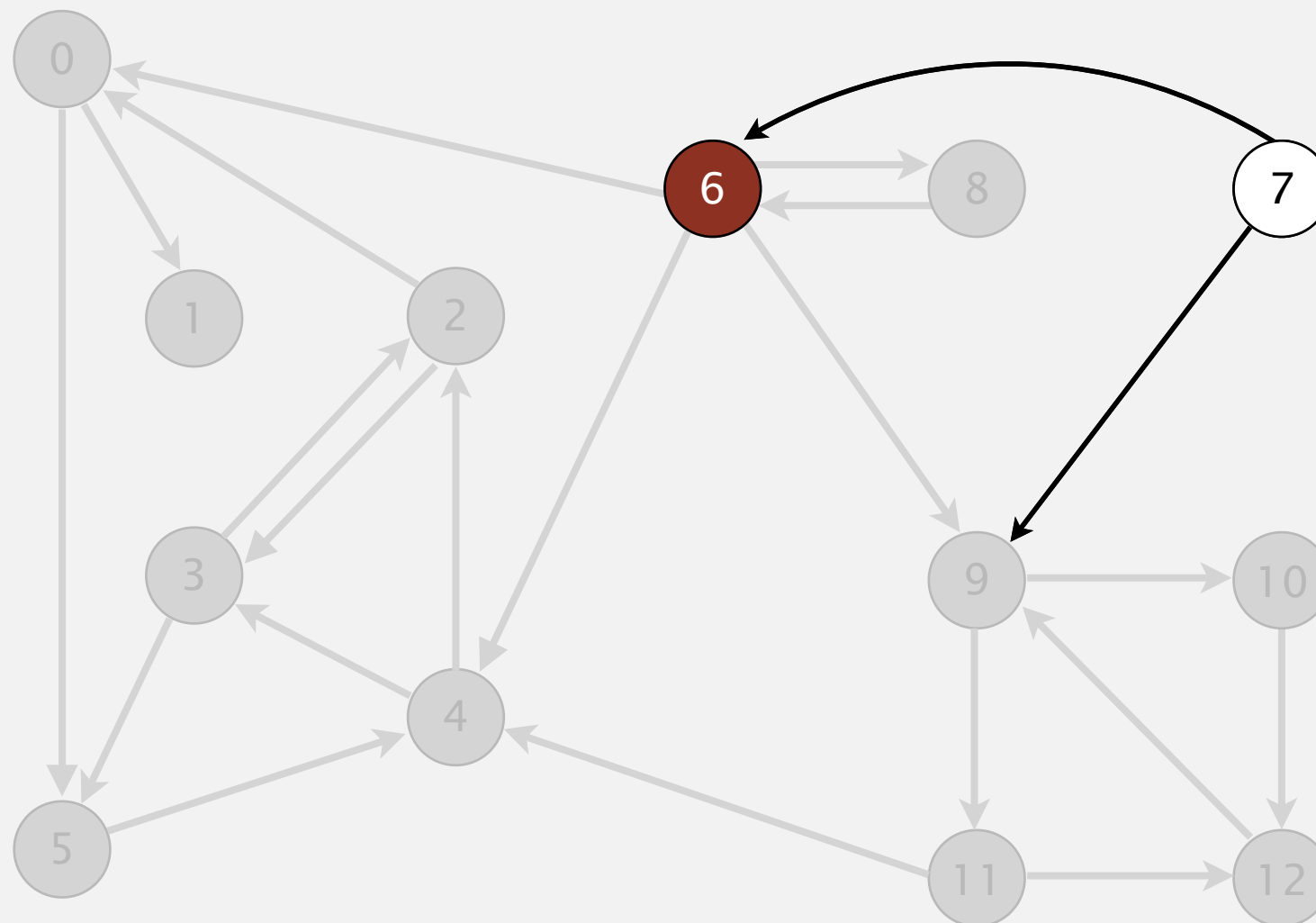


visit 6

| v | scc[v] |
|----------|---------------|
| 0 | 1 |
| 1 | 0 |
| 2 | 1 |
| 3 | 1 |
| 4 | 1 |
| 5 | 1 |
| 6 | 3 |
| 7 | - |
| 8 | 3 |
| 9 | 2 |
| 10 | 2 |
| 11 | 2 |
| 12 | 2 |

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 0 2 4 5 3 11 9 12 10 **6** 7 8

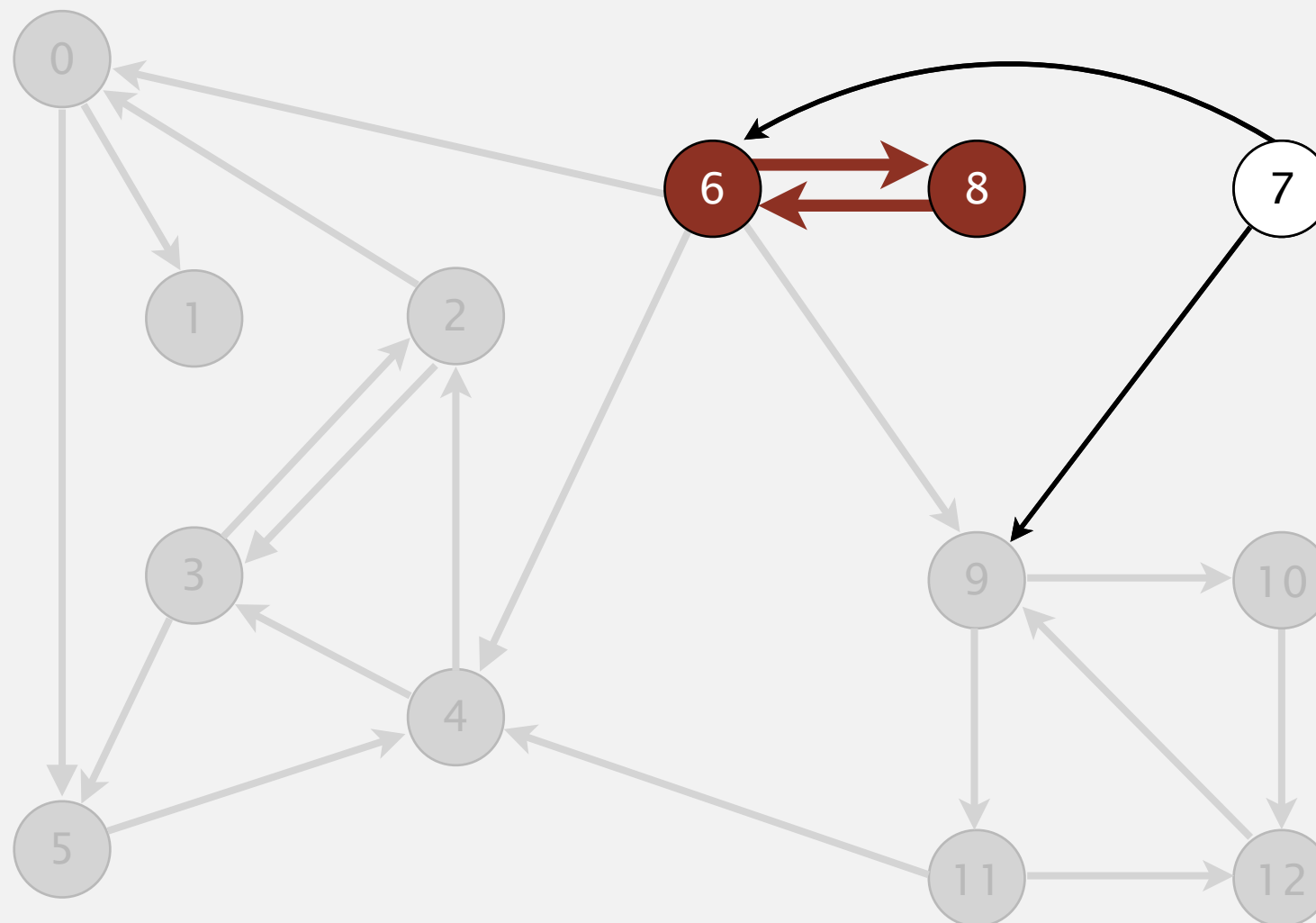


6 done

| v | scc[v] |
|----------|---------------|
| 0 | 1 |
| 1 | 0 |
| 2 | 1 |
| 3 | 1 |
| 4 | 1 |
| 5 | 1 |
| 6 | 3 |
| 7 | - |
| 8 | 3 |
| 9 | 2 |
| 10 | 2 |
| 11 | 2 |
| 12 | 2 |

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 0 2 4 5 3 11 9 12 10 **6** 7 8

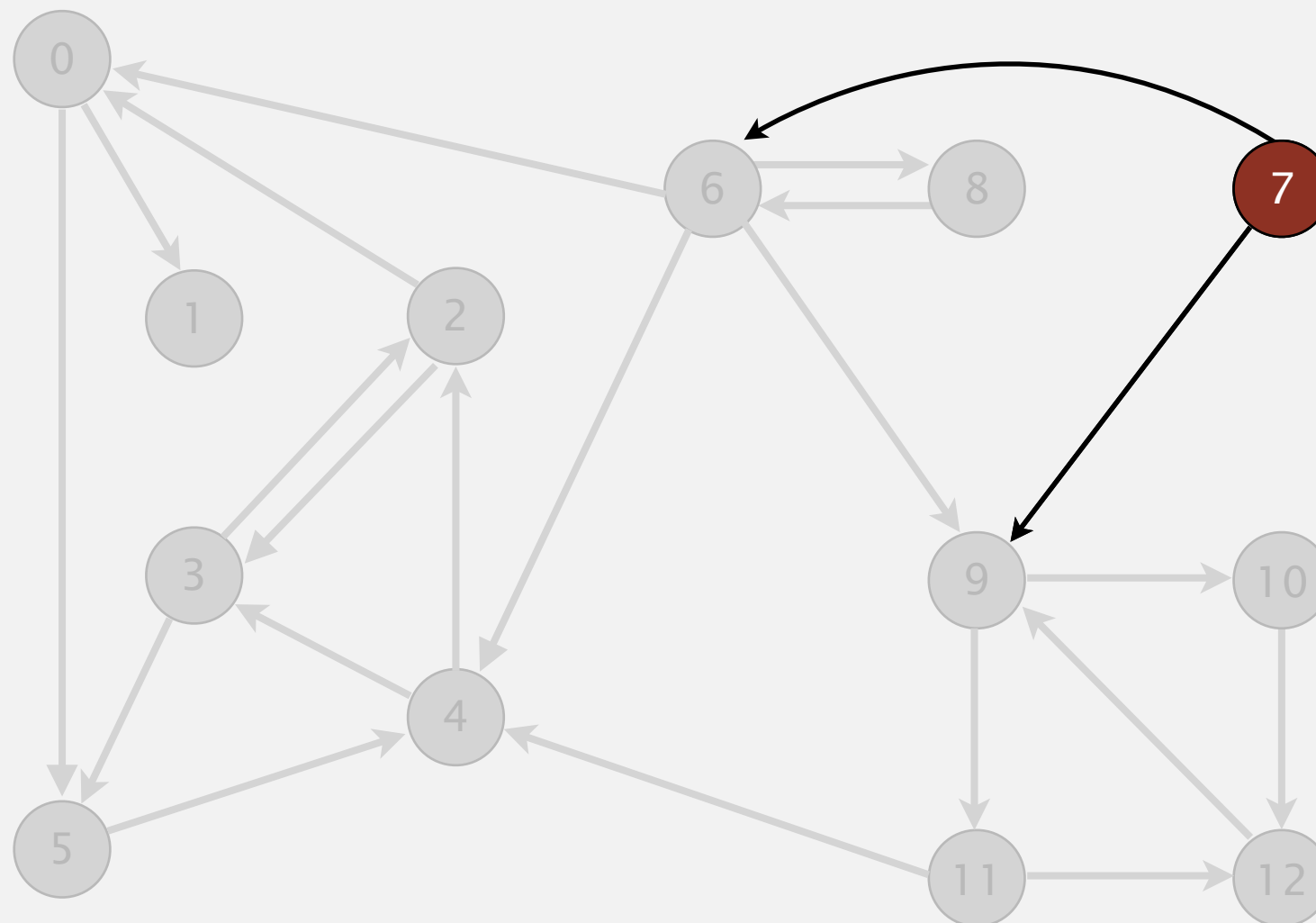


strong component: 6 8

| v | scc[v] |
|----------|---------------|
| 0 | 1 |
| 1 | 0 |
| 2 | 1 |
| 3 | 1 |
| 4 | 1 |
| 5 | 1 |
| 6 | 3 |
| 7 | - |
| 8 | 3 |
| 9 | 2 |
| 10 | 2 |
| 11 | 2 |
| 12 | 2 |

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 0 2 4 5 3 11 9 12 10 6 **7** 8

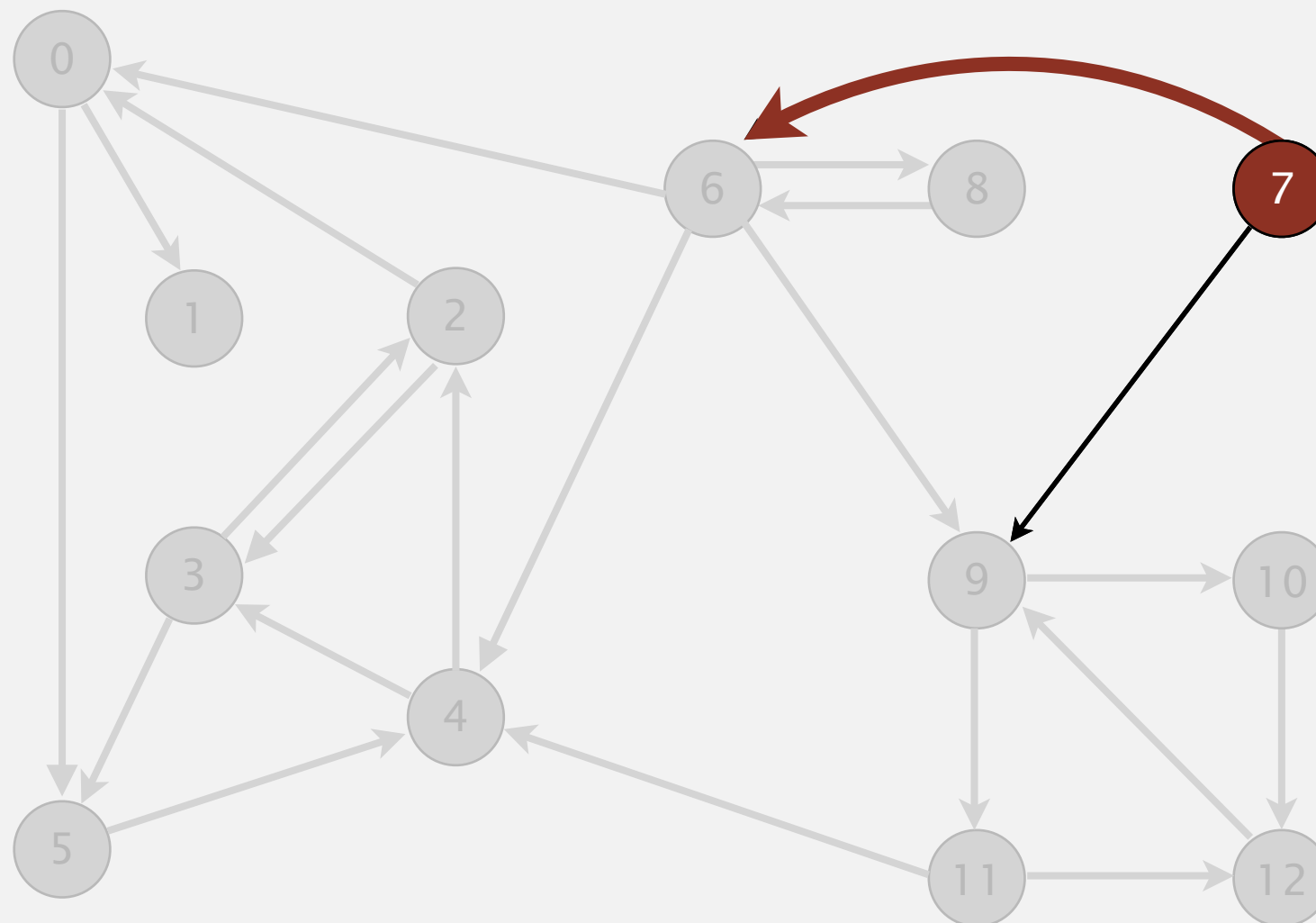


visit 7

| v | scc[v] |
|----|--------|
| 0 | 1 |
| 1 | 0 |
| 2 | 1 |
| 3 | 1 |
| 4 | 1 |
| 5 | 1 |
| 6 | 3 |
| 7 | 4 |
| 8 | 3 |
| 9 | 2 |
| 10 | 2 |
| 11 | 2 |
| 12 | 2 |

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 0 2 4 5 3 11 9 12 10 6 **7** 8

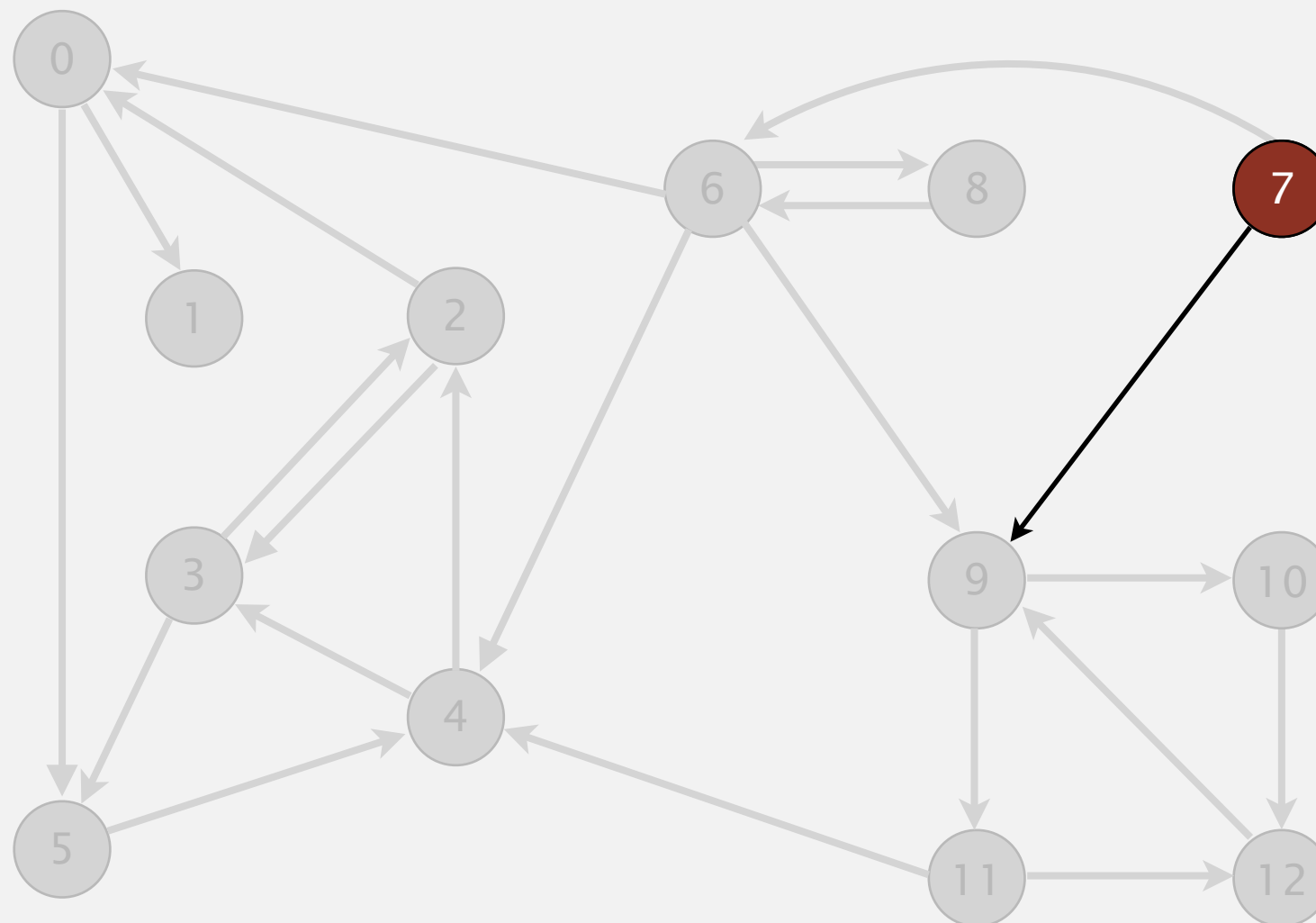


visit 7

| v | scc[v] |
|----|----------|
| 0 | 1 |
| 1 | 0 |
| 2 | 1 |
| 3 | 1 |
| 4 | 1 |
| 5 | 1 |
| 6 | 3 |
| 7 | 4 |
| 8 | 3 |
| 9 | 2 |
| 10 | 2 |
| 11 | 2 |
| 12 | 2 |

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 0 2 4 5 3 11 9 12 10 6 **7** 8

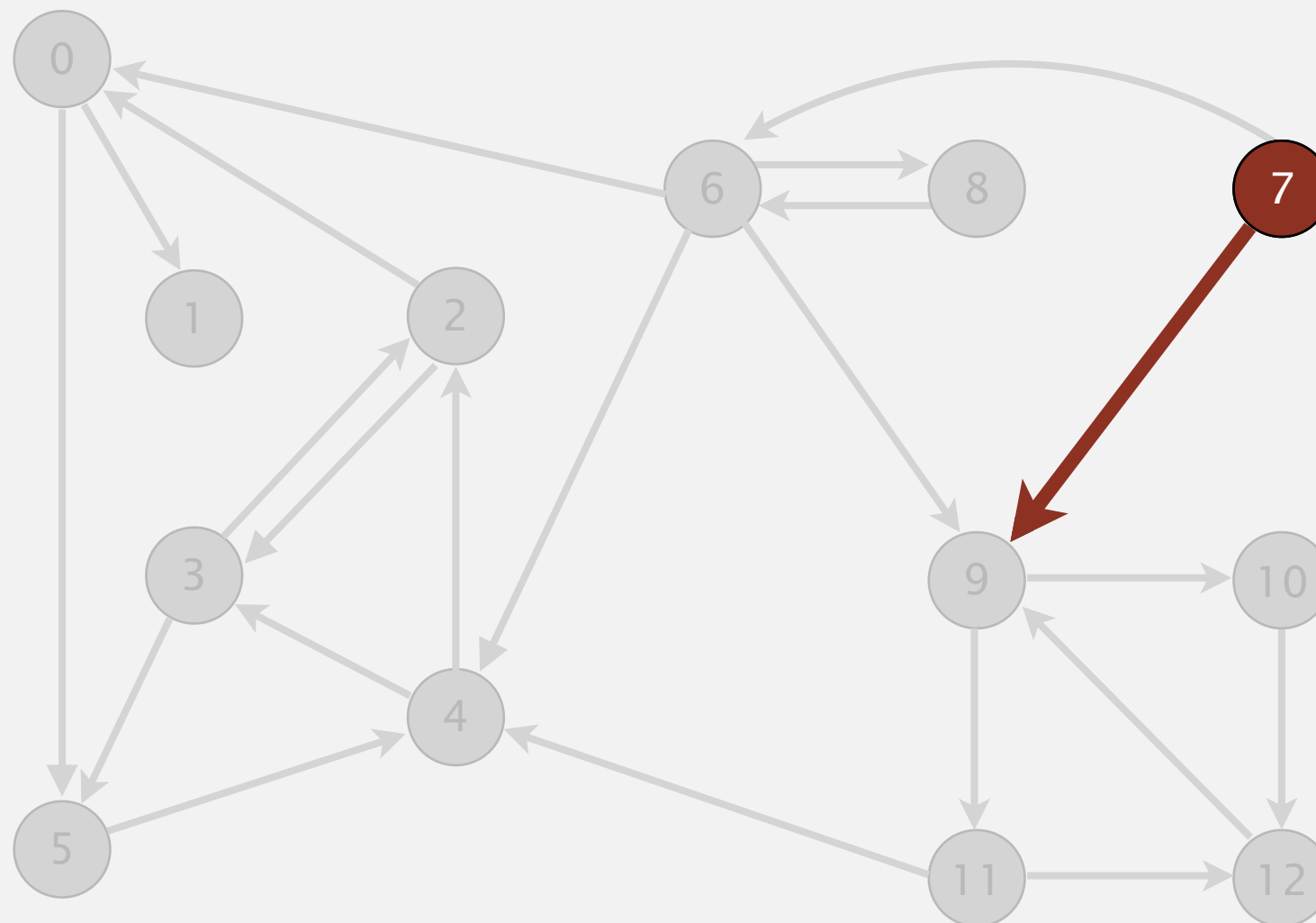


visit 7

| v | scc[v] |
|----------|---------------|
| 0 | 1 |
| 1 | 0 |
| 2 | 1 |
| 3 | 1 |
| 4 | 1 |
| 5 | 1 |
| 6 | 3 |
| 7 | 4 |
| 8 | 3 |
| 9 | 2 |
| 10 | 2 |
| 11 | 2 |
| 12 | 2 |

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 0 2 4 5 3 11 9 12 10 6 **7** 8

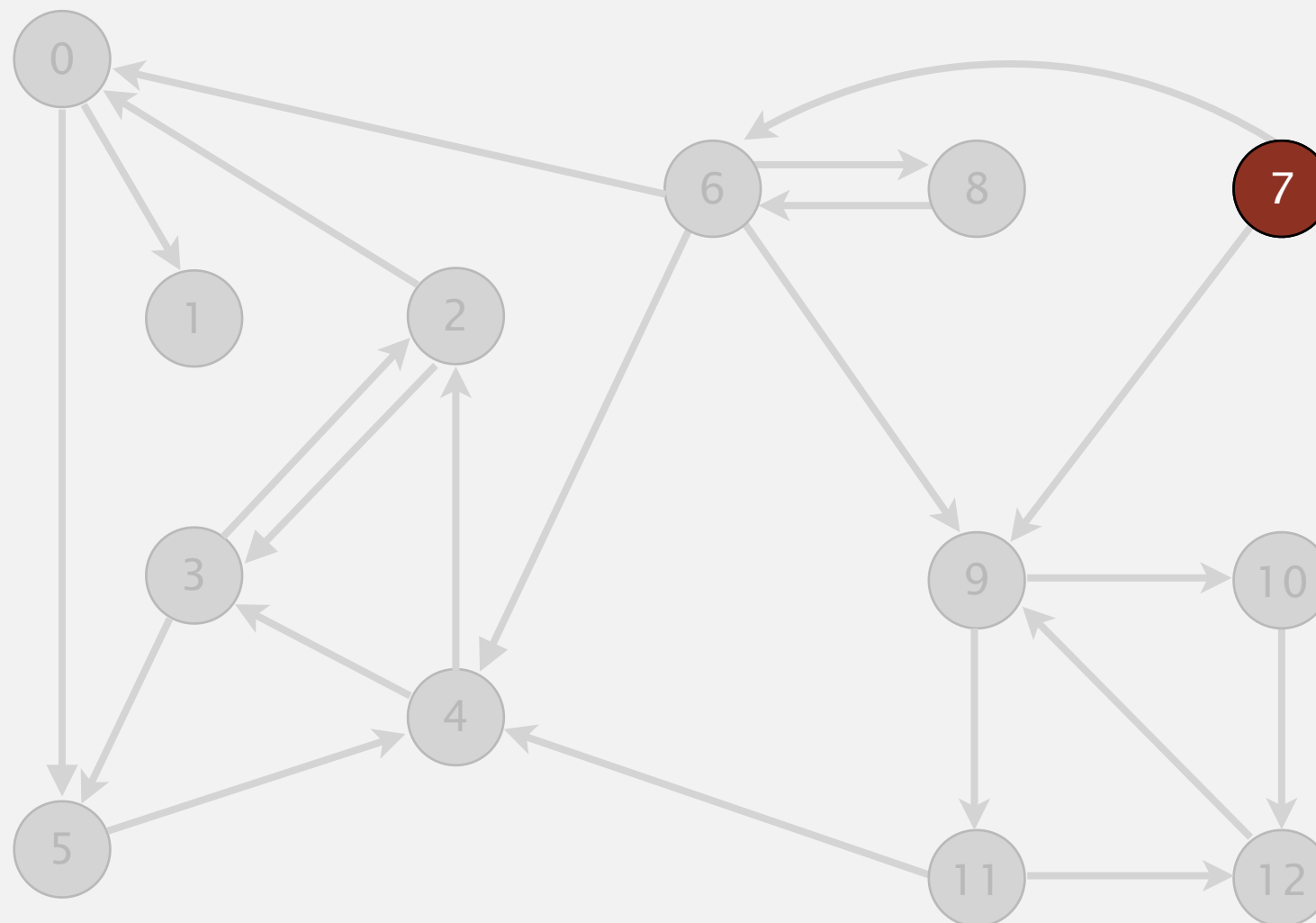


visit 7

| v | scc[v] |
|----------|---------------|
| 0 | 1 |
| 1 | 0 |
| 2 | 1 |
| 3 | 1 |
| 4 | 1 |
| 5 | 1 |
| 6 | 3 |
| 7 | 4 |
| 8 | 3 |
| 9 | 2 |
| 10 | 2 |
| 11 | 2 |
| 12 | 2 |

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 0 2 4 5 3 11 9 12 10 6 **7** 8

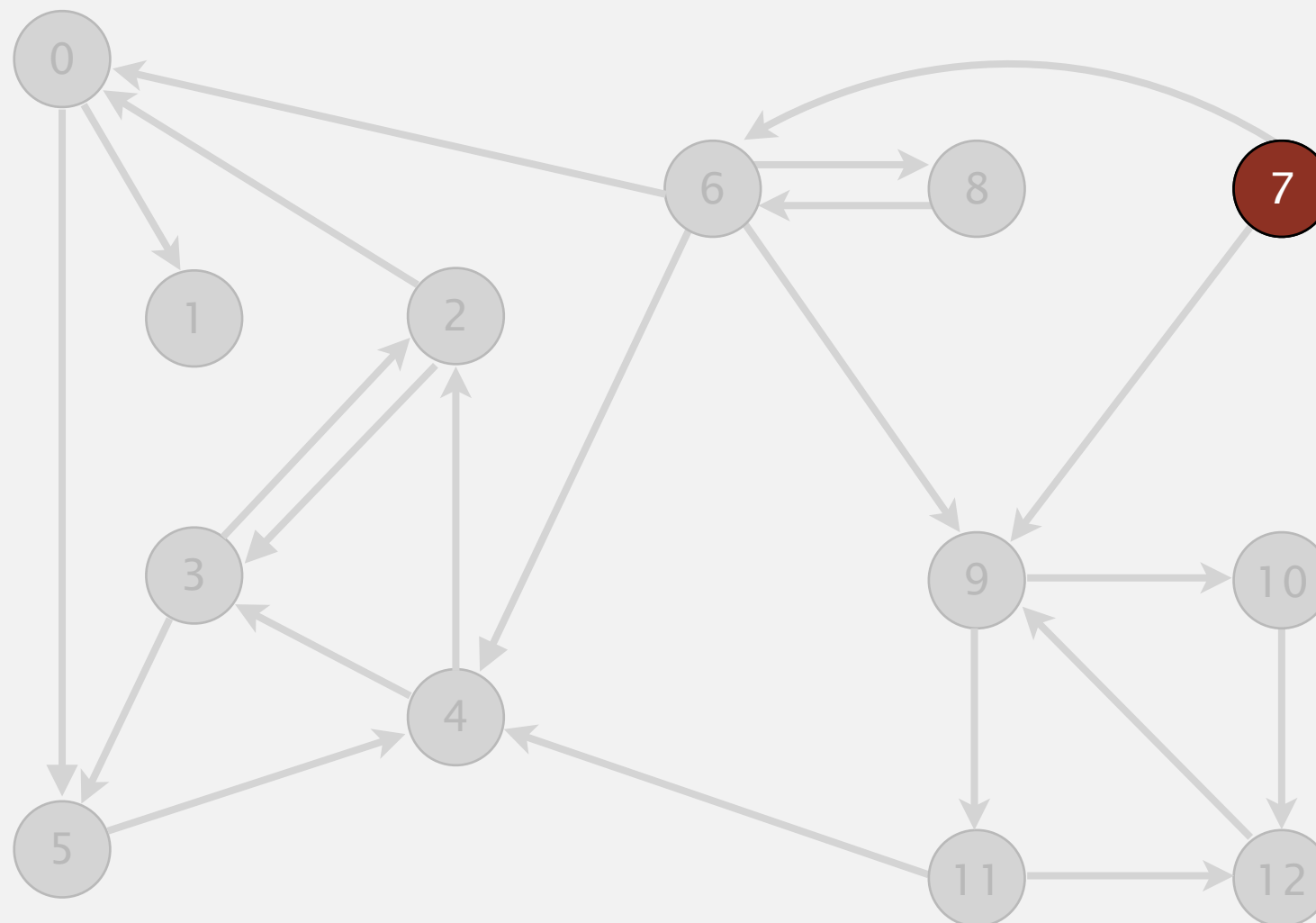


7 done

| v | scc[v] |
|----------|---------------|
| 0 | 1 |
| 1 | 0 |
| 2 | 1 |
| 3 | 1 |
| 4 | 1 |
| 5 | 1 |
| 6 | 3 |
| 7 | 4 |
| 8 | 3 |
| 9 | 2 |
| 10 | 2 |
| 11 | 2 |
| 12 | 2 |

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 0 2 4 5 3 11 9 12 10 6 **7** 8

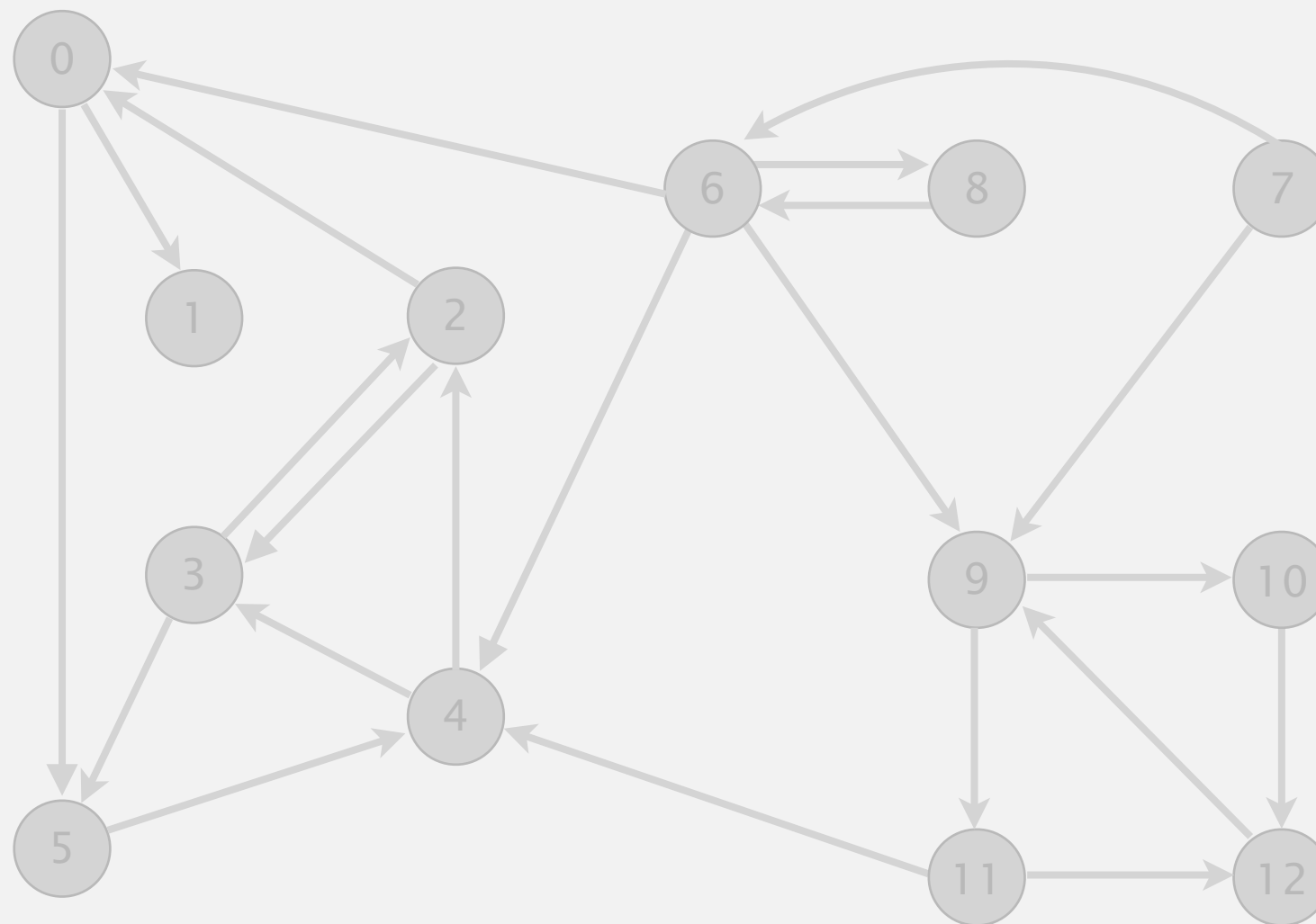


strong component: 7

| v | scc[v] |
|----------|---------------|
| 0 | 1 |
| 1 | 0 |
| 2 | 1 |
| 3 | 1 |
| 4 | 1 |
| 5 | 1 |
| 6 | 3 |
| 7 | 4 |
| 8 | 3 |
| 9 | 2 |
| 10 | 2 |
| 11 | 2 |
| 12 | 2 |

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 0 2 4 5 3 11 9 12 10 6 7 **8**

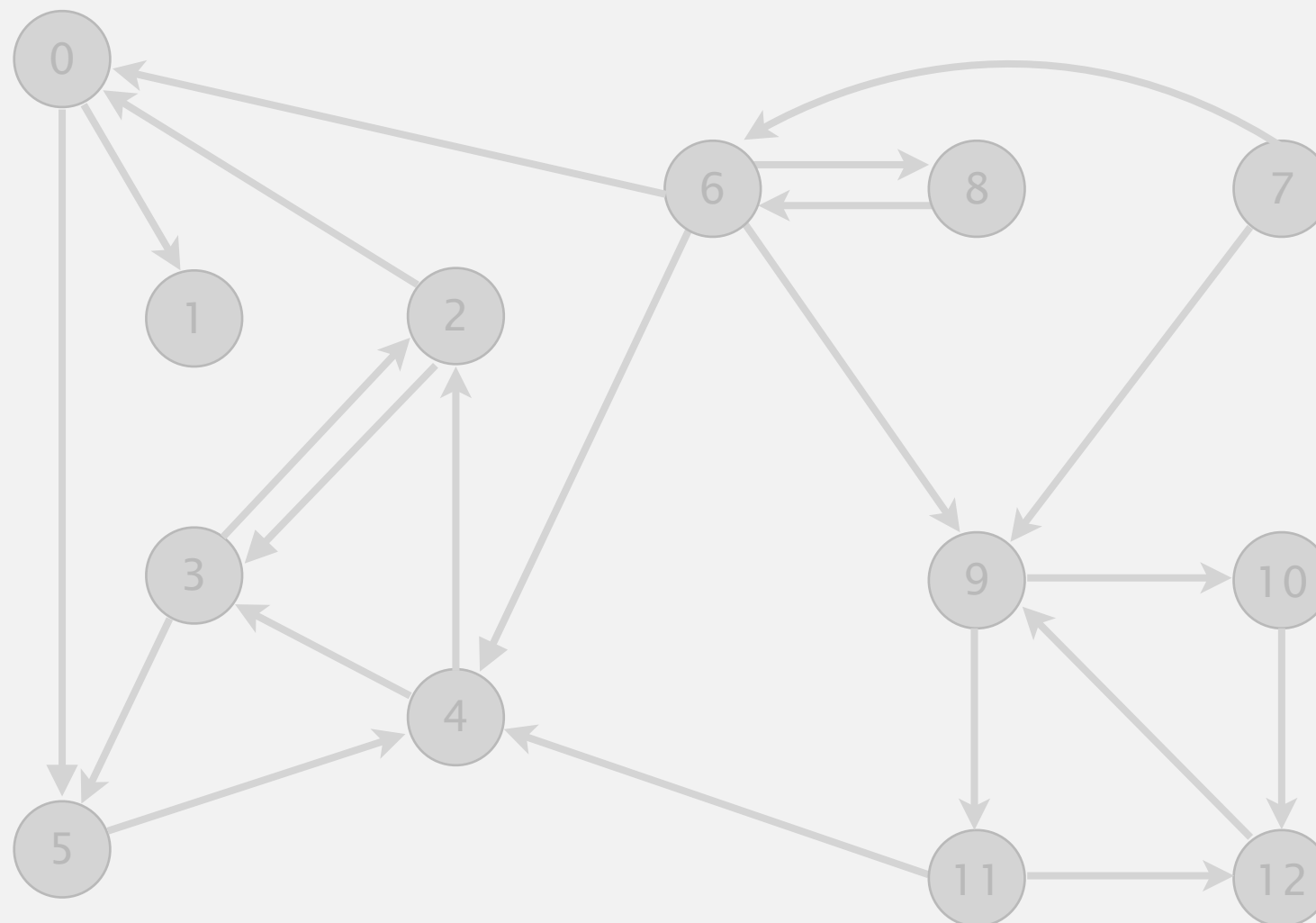


check 8

| v | scc[v] |
|----|--------|
| 0 | 1 |
| 1 | 0 |
| 2 | 1 |
| 3 | 1 |
| 4 | 1 |
| 5 | 1 |
| 6 | 3 |
| 7 | 4 |
| 8 | 3 |
| 9 | 2 |
| 10 | 2 |
| 11 | 2 |
| 12 | 2 |

Phase 2. Run DFS in G , visiting unmarked vertices in reverse postorder of G^R .

1 0 2 4 5 3 11 9 12 10 6 7 8



done

| v | scc[v] |
|----|--------|
| 0 | 1 |
| 1 | 0 |
| 2 | 1 |
| 3 | 1 |
| 4 | 1 |
| 5 | 1 |
| 6 | 3 |
| 7 | 4 |
| 8 | 3 |
| 9 | 2 |
| 10 | 2 |
| 11 | 2 |
| 12 | 2 |