

4.2 Depth-First Search

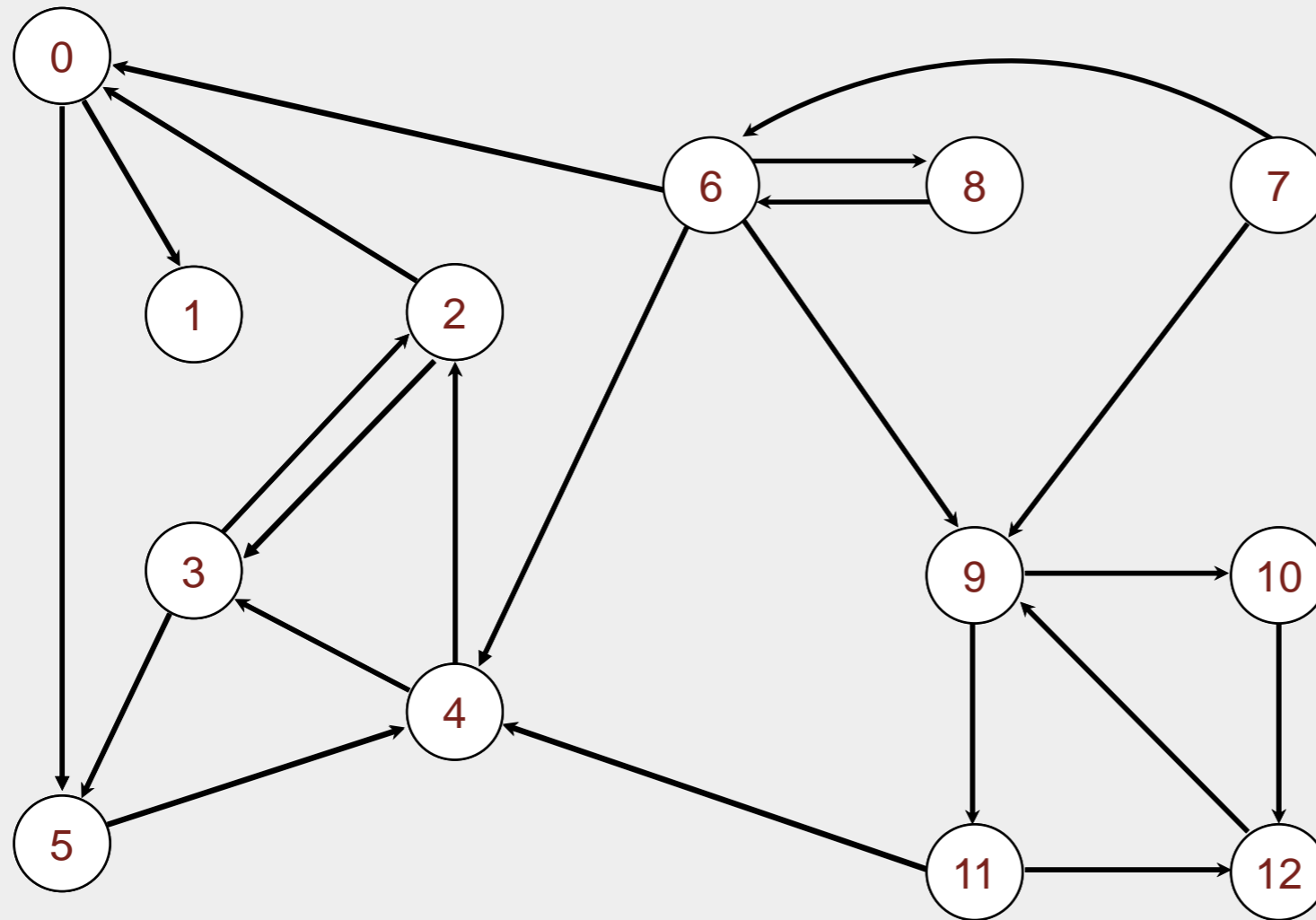


[click to begin demo](#)

Depth-first search

To visit a vertex v :

- Mark vertex v as visited.
- Recursively visit all unmarked vertices pointing from v .



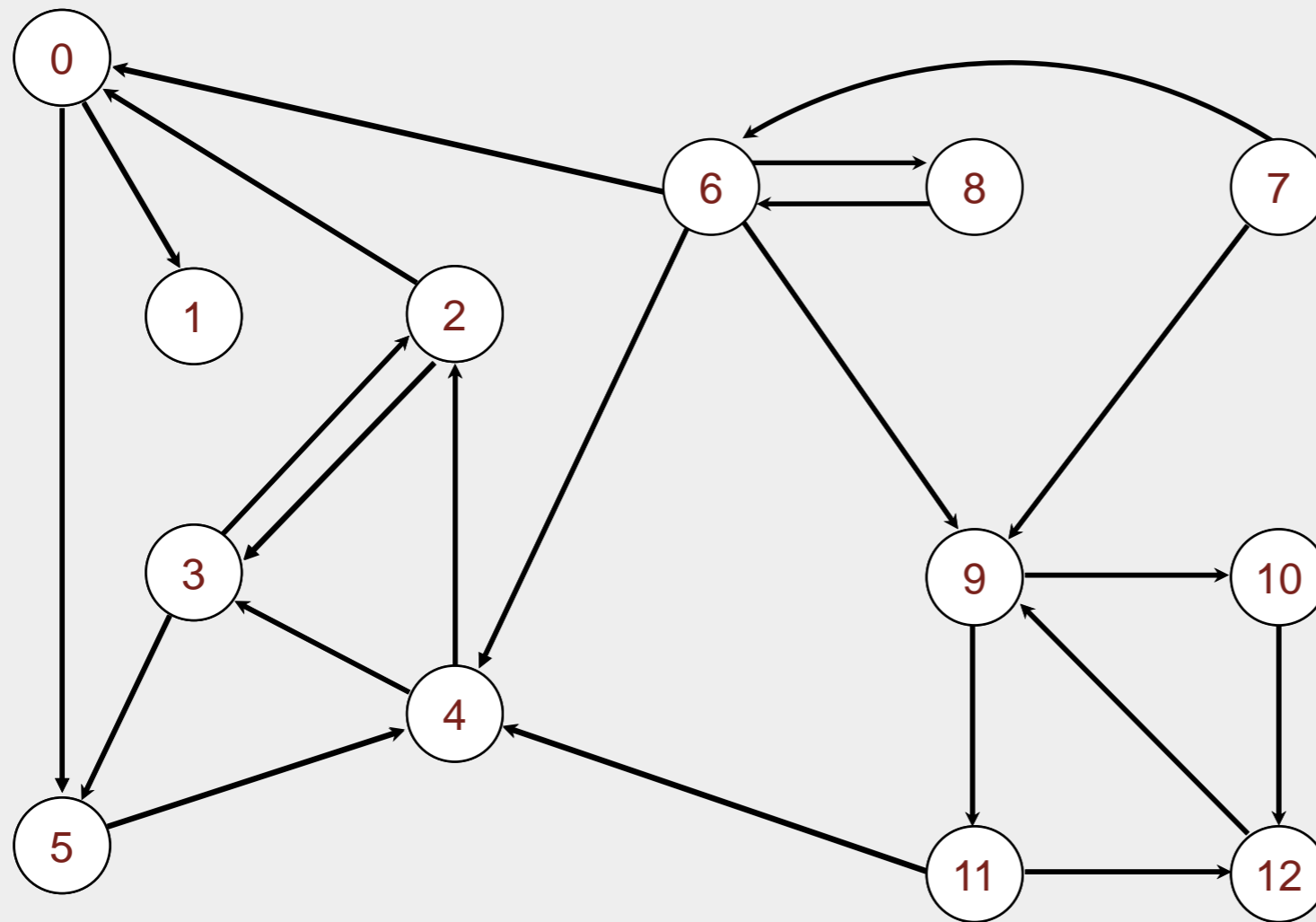
a directed graph

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

Depth-first search

To visit a vertex v :

- Mark vertex v as visited.
- Recursively visit all unmarked vertices pointing from v .



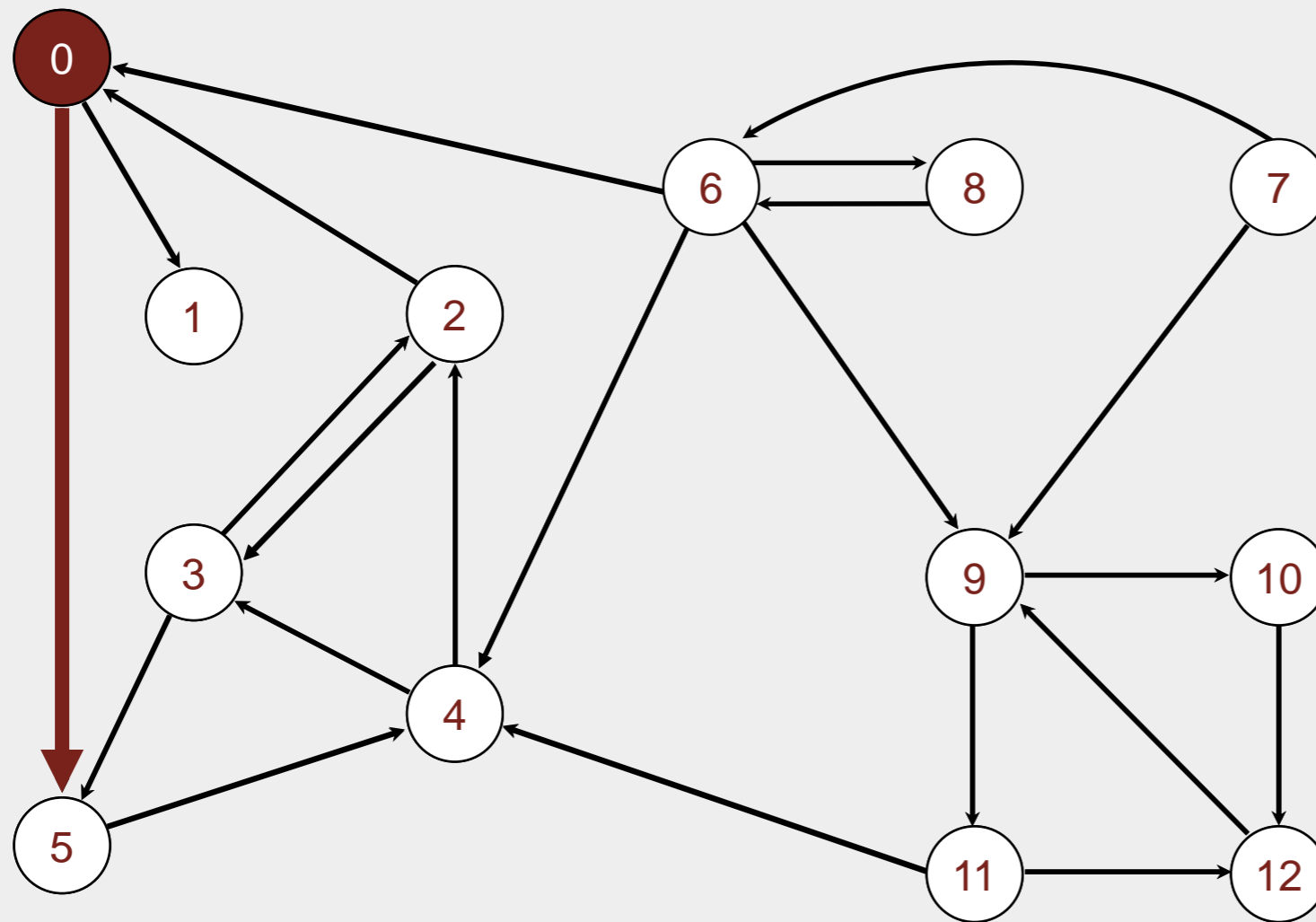
| v | marked[] | edgeTo[] |
|-----|----------|----------|
| 0 | F | — |
| 1 | F | — |
| 2 | F | — |
| 3 | F | — |
| 4 | F | — |
| 5 | F | — |
| 6 | F | — |
| 7 | F | — |
| 8 | F | — |
| 9 | F | — |
| 10 | F | — |
| 11 | F | — |
| 12 | F | — |

a directed graph

Depth-first search

To visit a vertex v :

- Mark vertex v as visited.
- Recursively visit all unmarked vertices pointing from v .



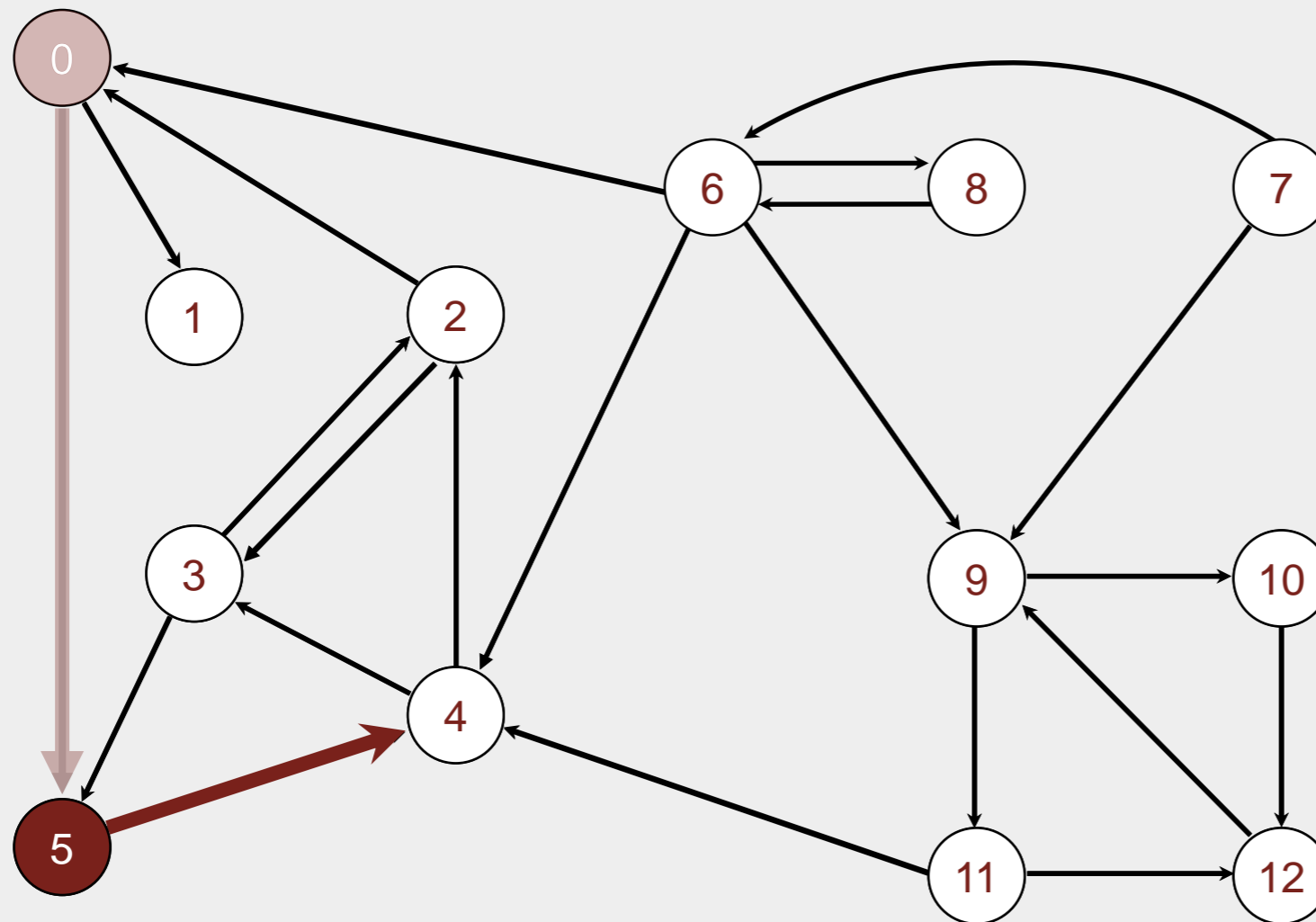
| v | marked[] | edgeTo[] |
|-----|----------|----------|
| 0 | Ⓟ | — |
| 1 | F | — |
| 2 | F | — |
| 3 | F | — |
| 4 | F | — |
| 5 | F | — |
| 6 | F | — |
| 7 | F | — |
| 8 | F | — |
| 9 | F | — |
| 10 | F | — |
| 11 | F | — |
| 12 | F | — |

visit 0

Depth-first search

To visit a vertex v :

- Mark vertex v as visited.
- Recursively visit all unmarked vertices pointing from v .



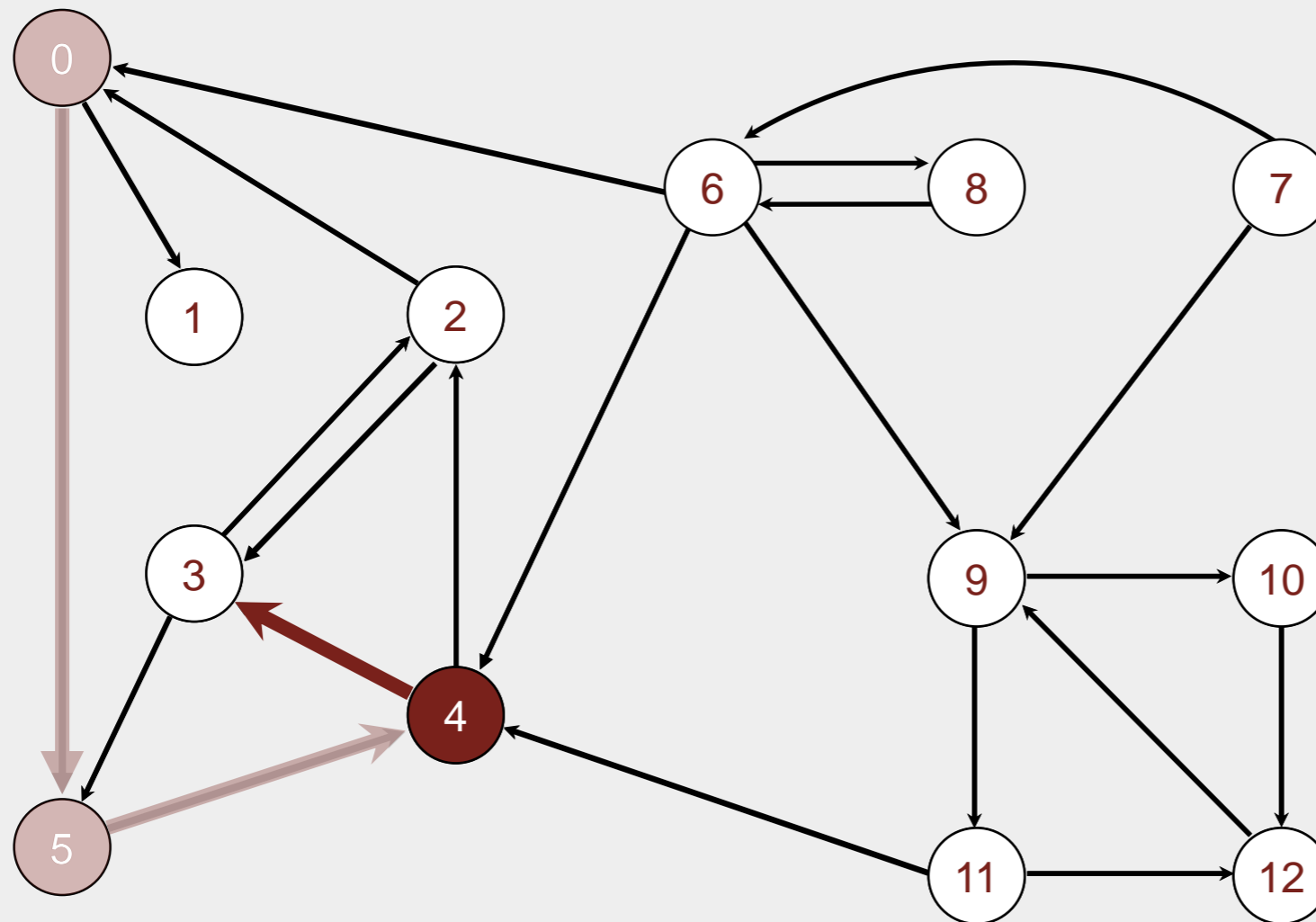
| v | marked[] | edgeTo[] |
|-----|----------|----------|
| 0 | T | - |
| 1 | F | - |
| 2 | F | - |
| 3 | F | - |
| 4 | F | - |
| 5 | T | 0 |
| 6 | F | - |
| 7 | F | - |
| 8 | F | - |
| 9 | F | - |
| 10 | F | - |
| 11 | F | - |
| 12 | F | - |

visit 5

Depth-first search

To visit a vertex v :

- Mark vertex v as visited.
- Recursively visit all unmarked vertices pointing from v .



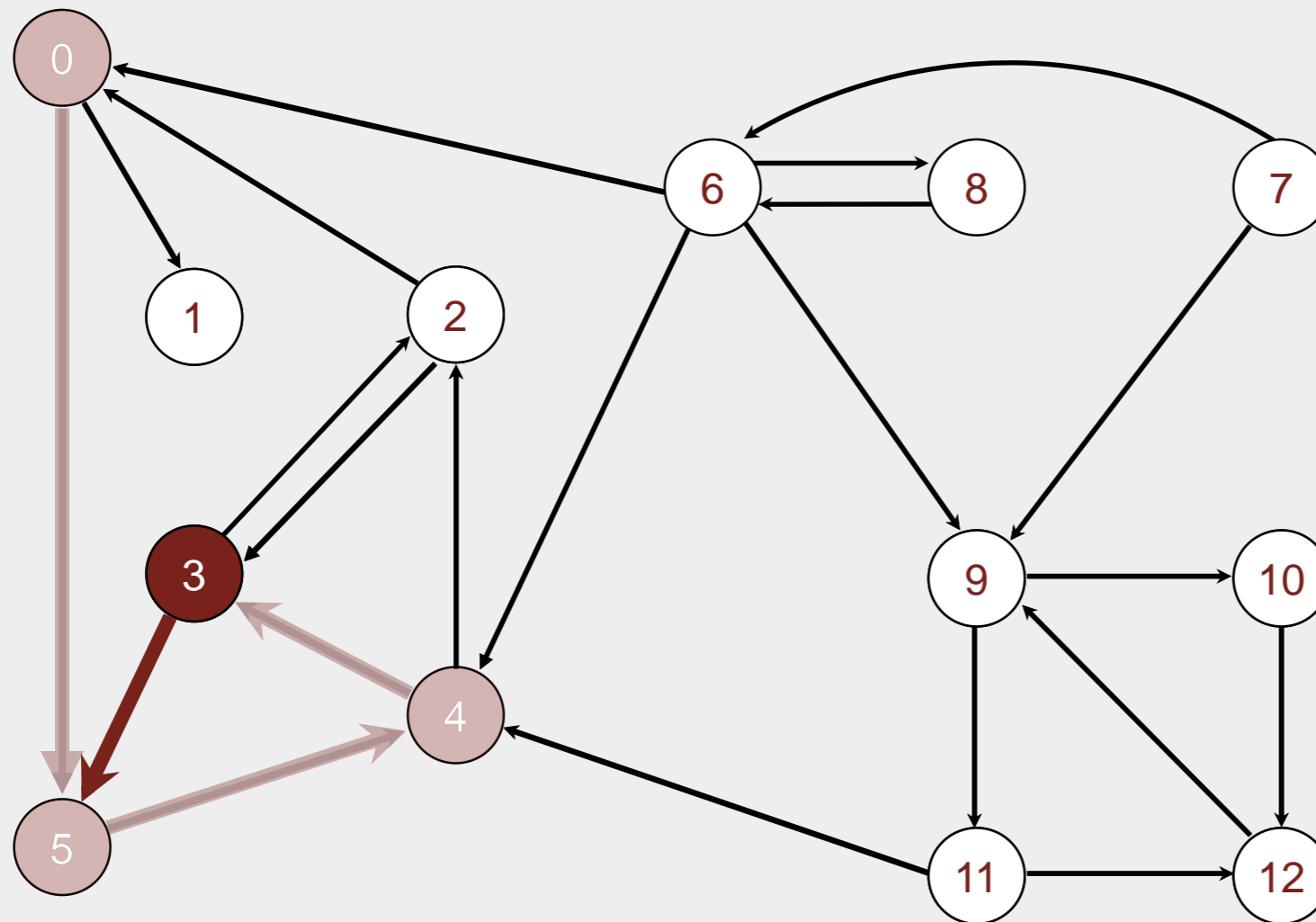
| v | marked[] | edgeTo[] |
|-----|----------|----------|
| 0 | T | — |
| 1 | F | — |
| 2 | F | — |
| 3 | F | — |
| 4 | T | 5 |
| 5 | T | 0 |
| 6 | F | — |
| 7 | F | — |
| 8 | F | — |
| 9 | F | — |
| 10 | F | — |
| 11 | F | — |
| 12 | F | — |

visit 4

Depth-first search

To visit a vertex v :

- Mark vertex v as visited.
- Recursively visit all unmarked vertices pointing from v .



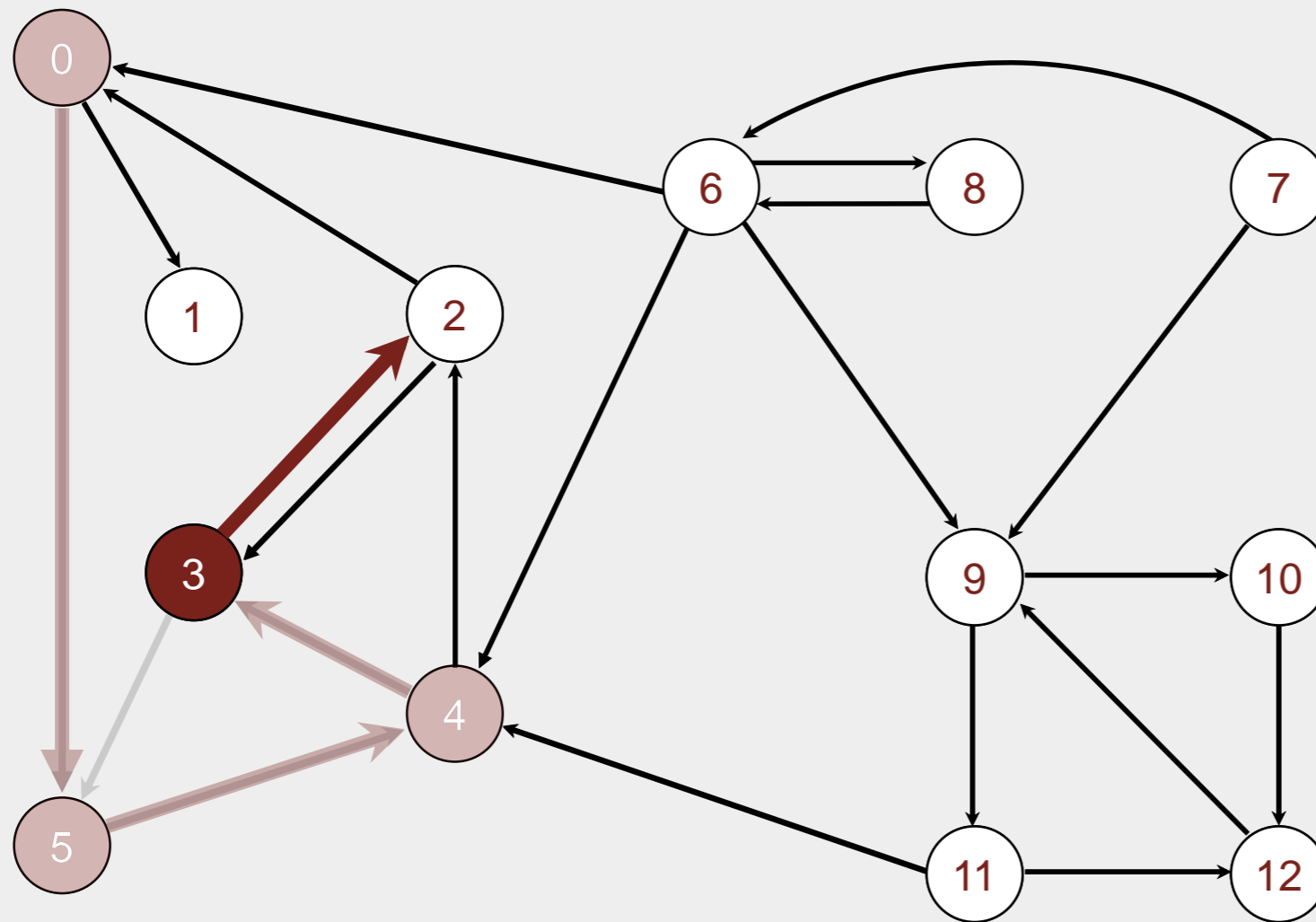
| v | marked[] | edgeTo[] |
|-----|----------|----------|
| 0 | T | - |
| 1 | F | - |
| 2 | F | - |
| 3 | T | 4 |
| 4 | T | 5 |
| 5 | T | 0 |
| 6 | F | - |
| 7 | F | - |
| 8 | F | - |
| 9 | F | - |
| 10 | F | - |
| 11 | F | - |
| 12 | F | - |

visit 3

Depth-first search

To visit a vertex v :

- Mark vertex v as visited.
- Recursively visit all unmarked vertices pointing from v .



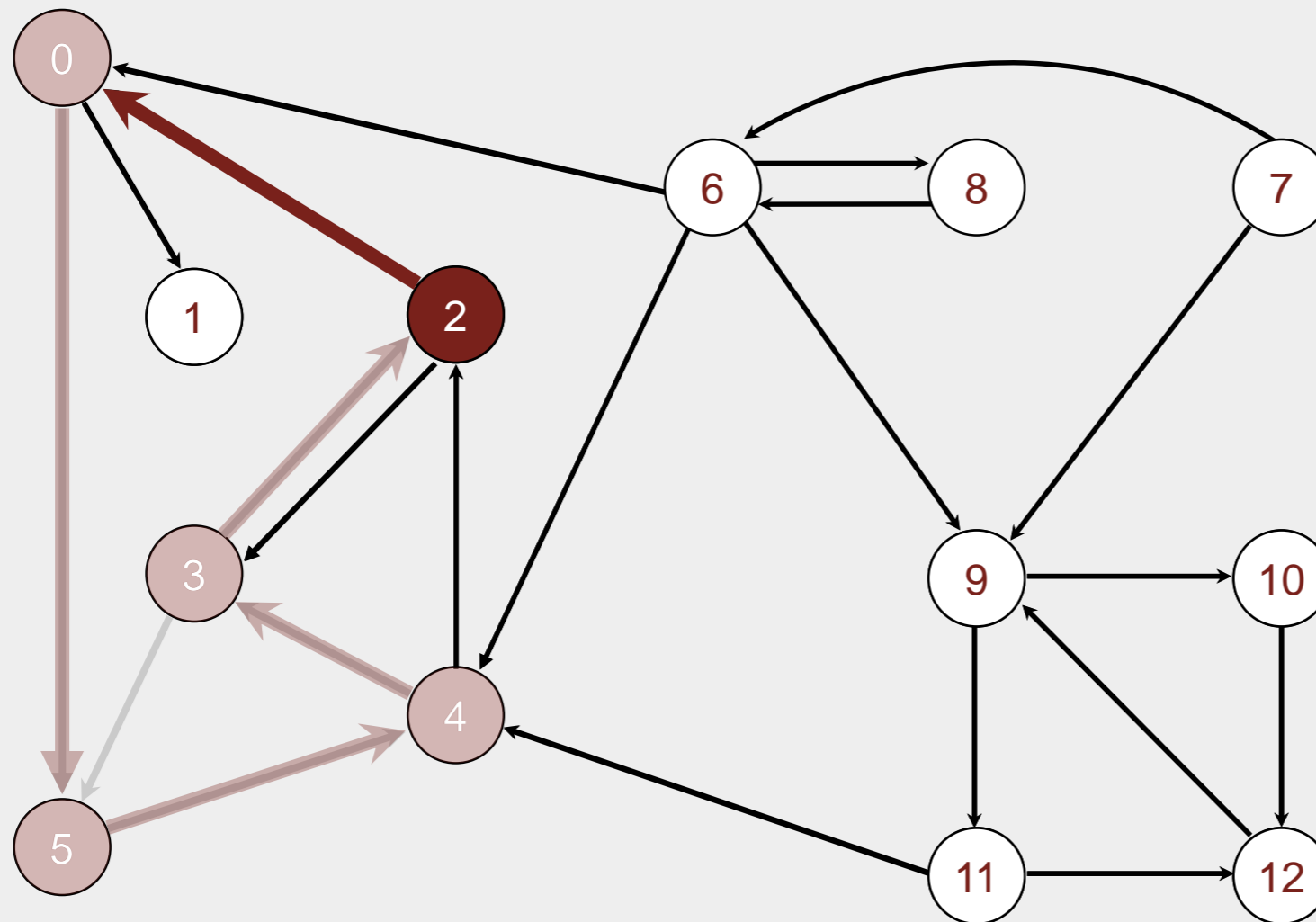
| v | marked[] | edgeTo[] |
|-----|----------|----------|
| 0 | T | — |
| 1 | F | — |
| 2 | F | — |
| 3 | T | 4 |
| 4 | T | 5 |
| 5 | T | 0 |
| 6 | F | — |
| 7 | F | — |
| 8 | F | — |
| 9 | F | — |
| 10 | F | — |
| 11 | F | — |
| 12 | F | — |

visit 3

Depth-first search

To visit a vertex v :

- Mark vertex v as visited.
- Recursively visit all unmarked vertices pointing from v .



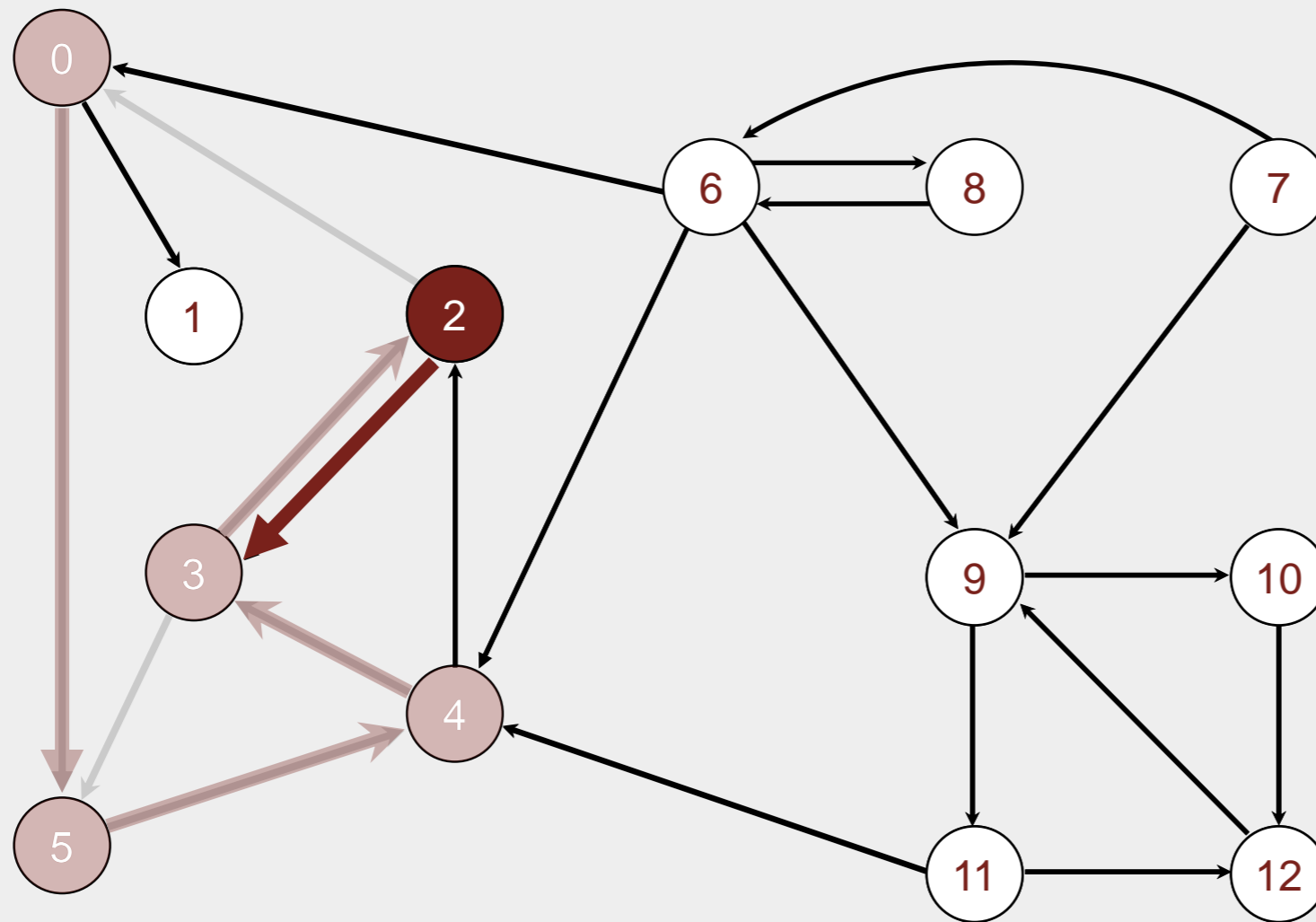
| v | marked[] | edgeTo[] |
|-----|----------|----------|
| 0 | T | — |
| 1 | F | — |
| 2 | T | 3 |
| 3 | T | 4 |
| 4 | T | 5 |
| 5 | T | 0 |
| 6 | F | — |
| 7 | F | — |
| 8 | F | — |
| 9 | F | — |
| 10 | F | — |
| 11 | F | — |
| 12 | F | — |

visit 2

Depth-first search

To visit a vertex v :

- Mark vertex v as visited.
- Recursively visit all unmarked vertices pointing from v .



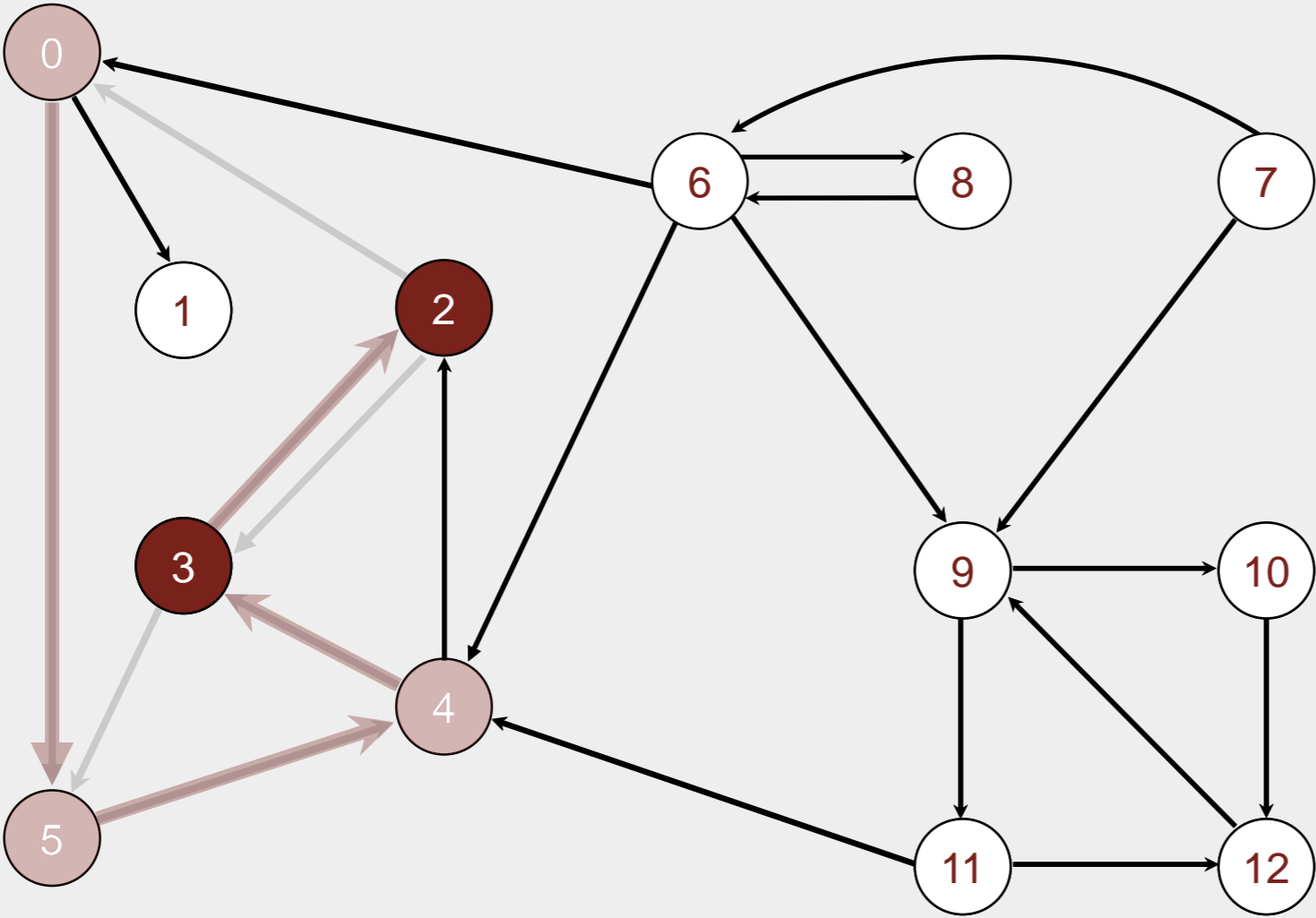
| v | marked[] | edgeTo[] |
|-----|----------|----------|
| 0 | T | — |
| 1 | F | — |
| 2 | T | 3 |
| 3 | T | 4 |
| 4 | T | 5 |
| 5 | T | 0 |
| 6 | F | — |
| 7 | F | — |
| 8 | F | — |
| 9 | F | — |
| 10 | F | — |
| 11 | F | — |
| 12 | F | — |

visit 2

Depth-first search

To visit a vertex v :

- Mark vertex v as visited.
- Recursively visit all unmarked vertices pointing from v .



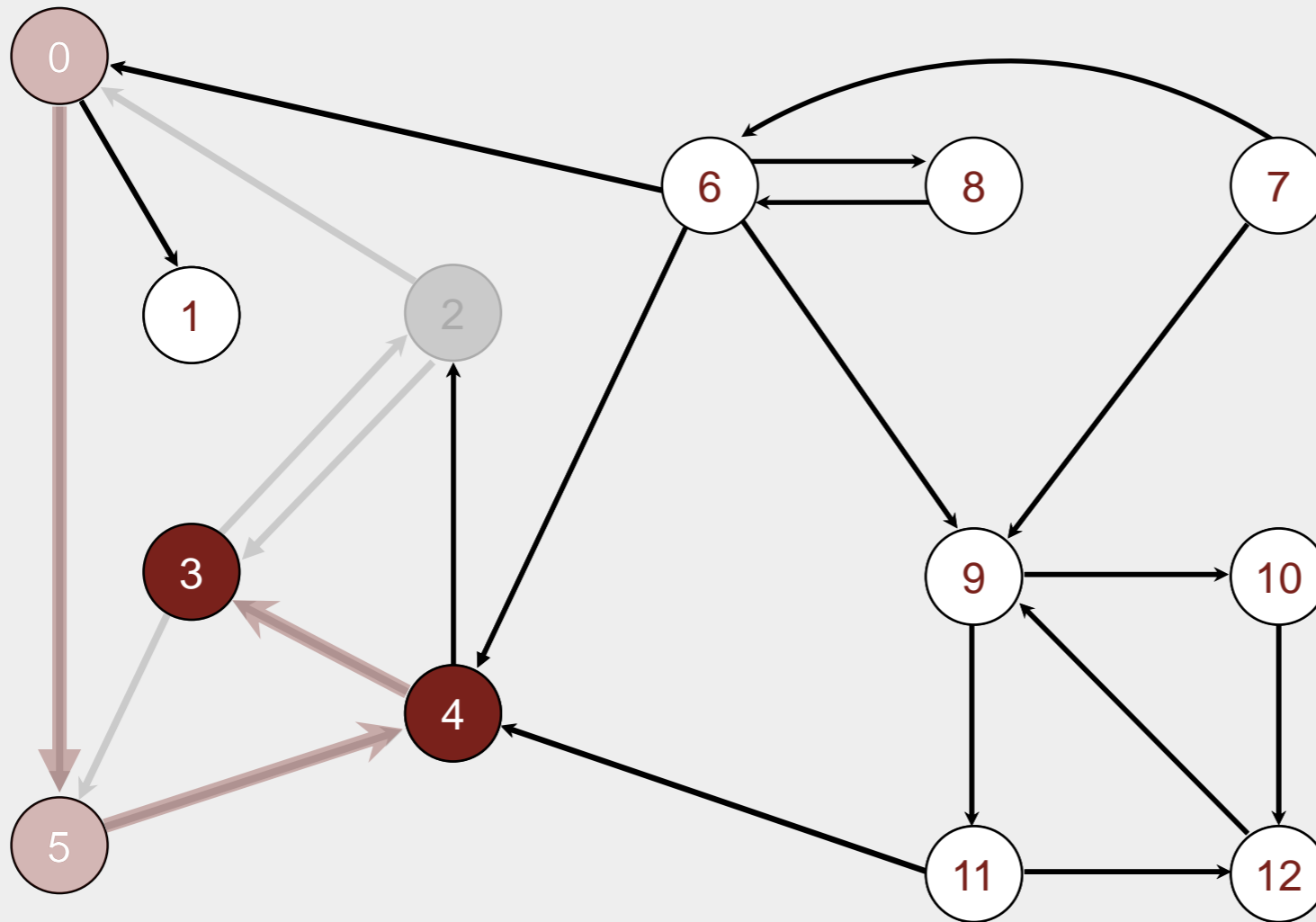
done 2

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

Depth-first search

To visit a vertex v :

- Mark vertex v as visited.
- Recursively visit all unmarked vertices pointing from v .



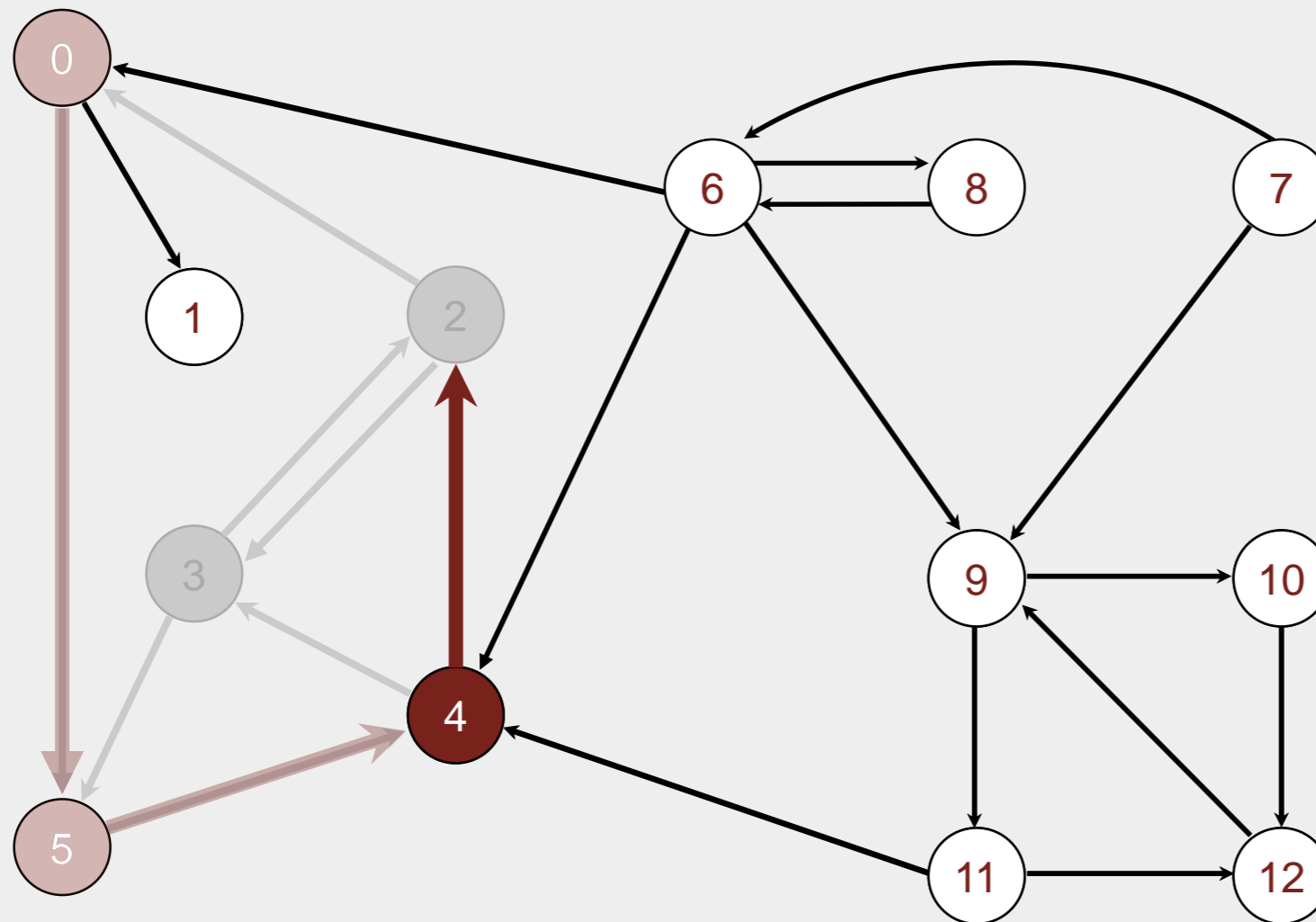
| v | marked[] | edgeTo[] |
|-----|----------|----------|
| 0 | T | — |
| 1 | F | — |
| 2 | T | 3 |
| 3 | T | 4 |
| 4 | T | 5 |
| 5 | T | 0 |
| 6 | F | — |
| 7 | F | — |
| 8 | F | — |
| 9 | F | — |
| 10 | F | — |
| 11 | F | — |
| 12 | F | — |

done 3

Depth-first search

To visit a vertex v :

- Mark vertex v as visited.
- Recursively visit all unmarked vertices pointing from v .



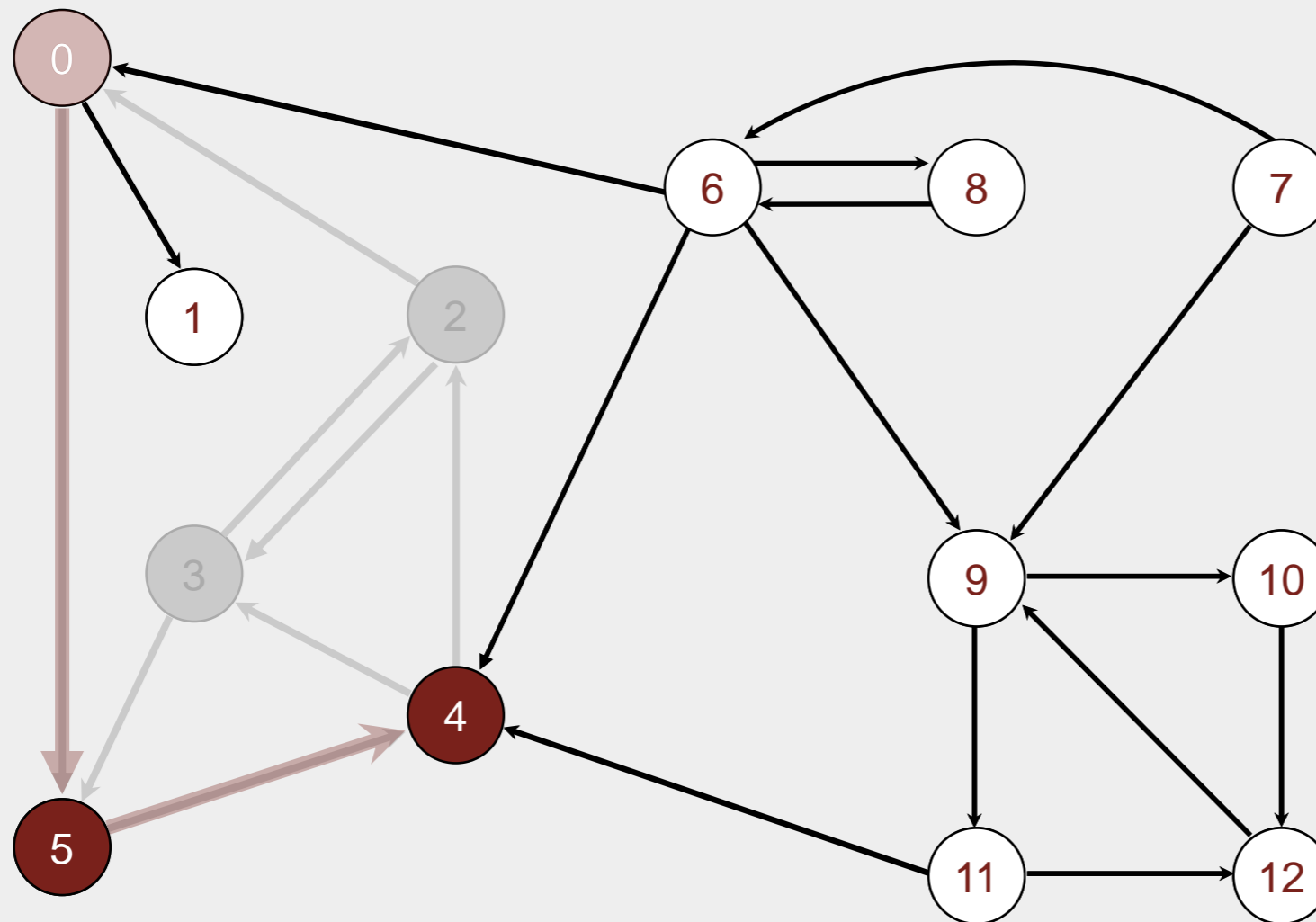
| v | marked[] | edgeTo[] |
|-----|----------|----------|
| 0 | T | — |
| 1 | F | — |
| 2 | T | 3 |
| 3 | T | 4 |
| 4 | T | 5 |
| 5 | T | 0 |
| 6 | F | — |
| 7 | F | — |
| 8 | F | — |
| 9 | F | — |
| 10 | F | — |
| 11 | F | — |
| 12 | F | — |

visit 4

Depth-first search

To visit a vertex v :

- Mark vertex v as visited.
- Recursively visit all unmarked vertices pointing from v .



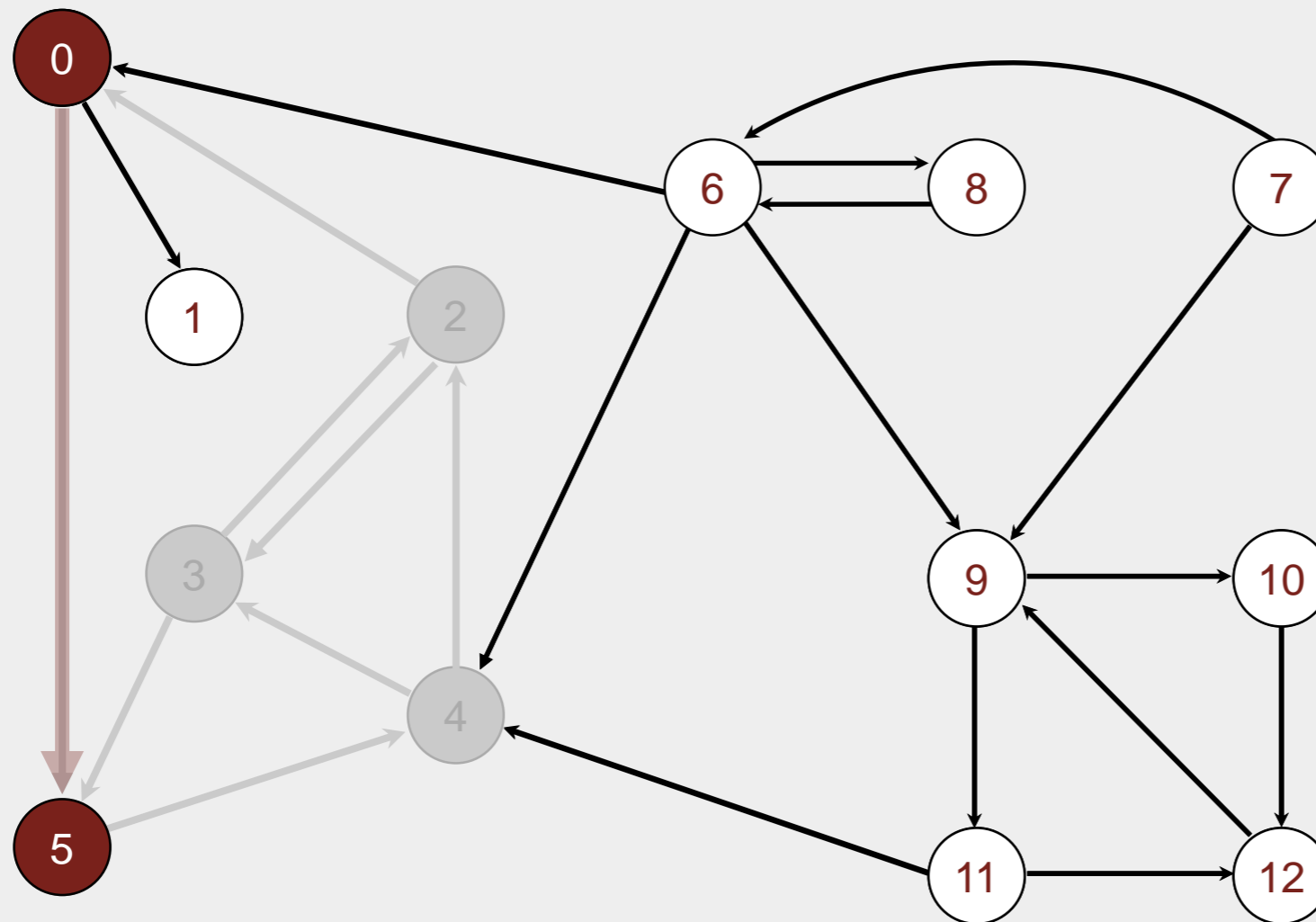
| v | marked[] | edgeTo[] |
|-----|----------|----------|
| 0 | T | — |
| 1 | F | — |
| 2 | T | 3 |
| 3 | T | 4 |
| 4 | T | 5 |
| 5 | T | 0 |
| 6 | F | — |
| 7 | F | — |
| 8 | F | — |
| 9 | F | — |
| 10 | F | — |
| 11 | F | — |
| 12 | F | — |

done 4

Depth-first search

To visit a vertex v :

- Mark vertex v as visited.
- Recursively visit all unmarked vertices pointing from v .



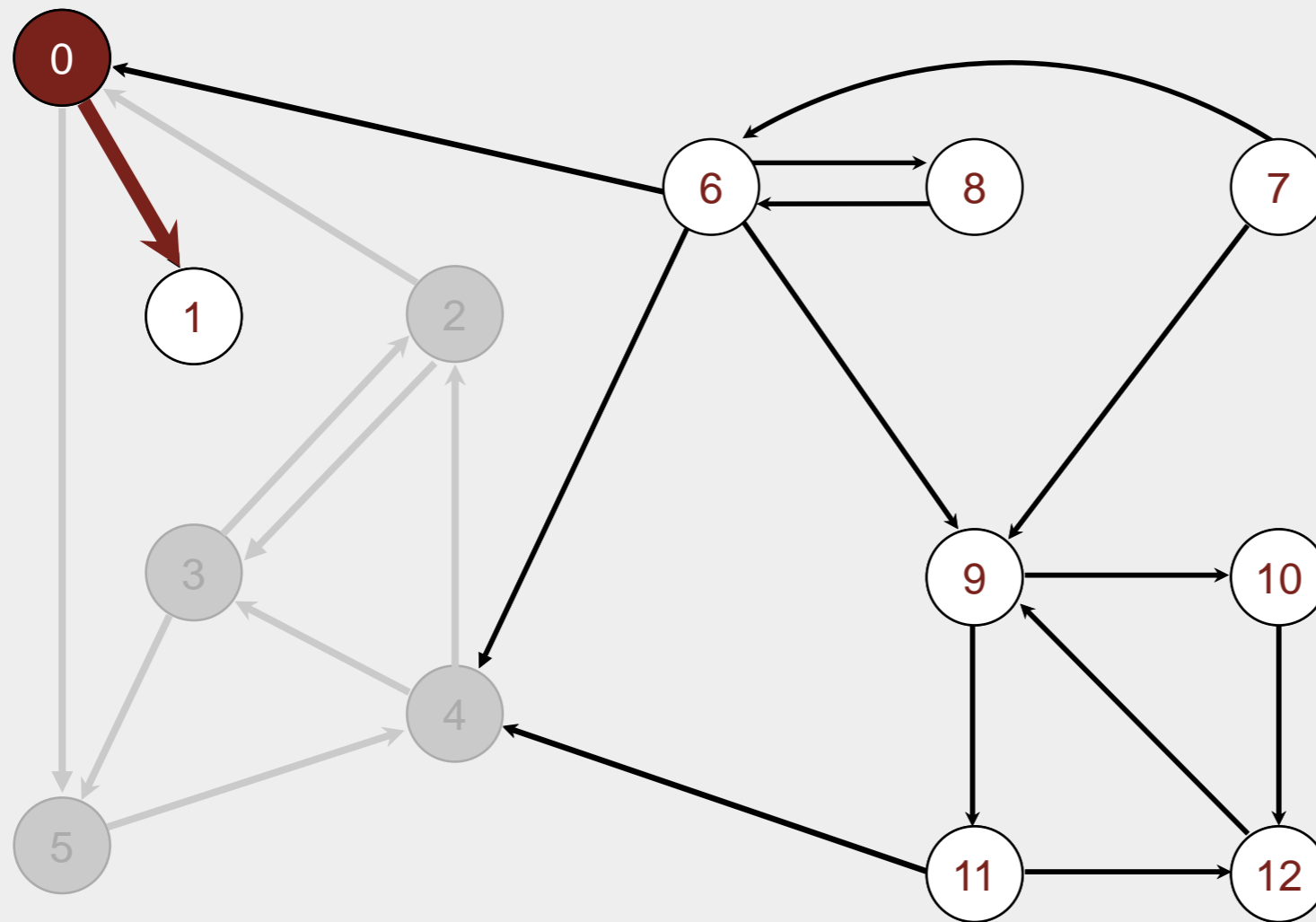
| v | marked[] | edgeTo[] |
|-----|----------|----------|
| 0 | T | — |
| 1 | F | — |
| 2 | T | 3 |
| 3 | T | 4 |
| 4 | T | 5 |
| 5 | T | 0 |
| 6 | F | — |
| 7 | F | — |
| 8 | F | — |
| 9 | F | — |
| 10 | F | — |
| 11 | F | — |
| 12 | F | — |

done 5

Depth-first search

To visit a vertex v :

- Mark vertex v as visited.
- Recursively visit all unmarked vertices pointing from v .



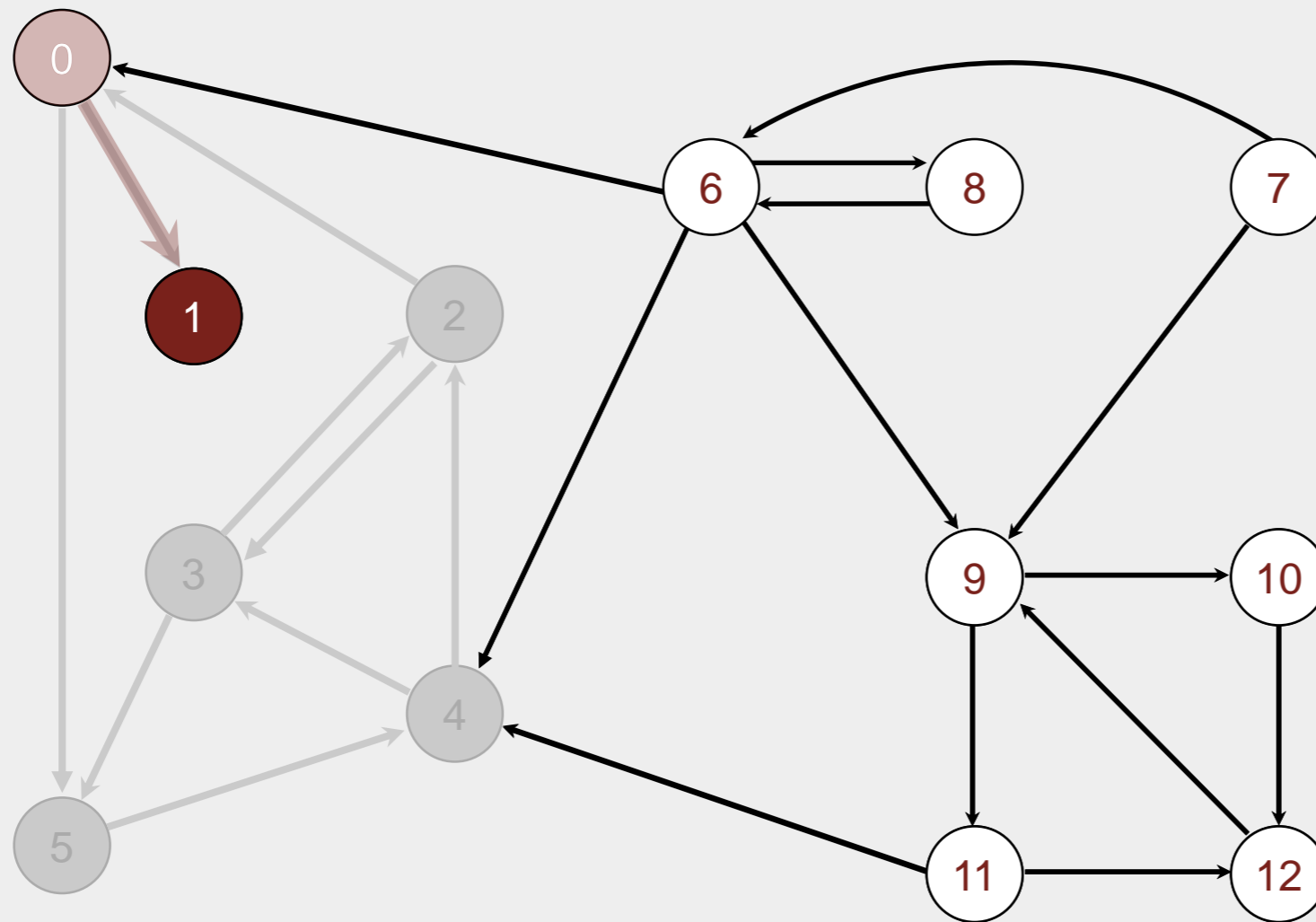
| v | marked[] | edgeTo[] |
|-----|----------|----------|
| 0 | T | - |
| 1 | F | - |
| 2 | T | 3 |
| 3 | T | 4 |
| 4 | T | 5 |
| 5 | T | 0 |
| 6 | F | - |
| 7 | F | - |
| 8 | F | - |
| 9 | F | - |
| 10 | F | - |
| 11 | F | - |
| 12 | F | - |

visit 0

Depth-first search

To visit a vertex v :

- Mark vertex v as visited.
- Recursively visit all unmarked vertices pointing from v .



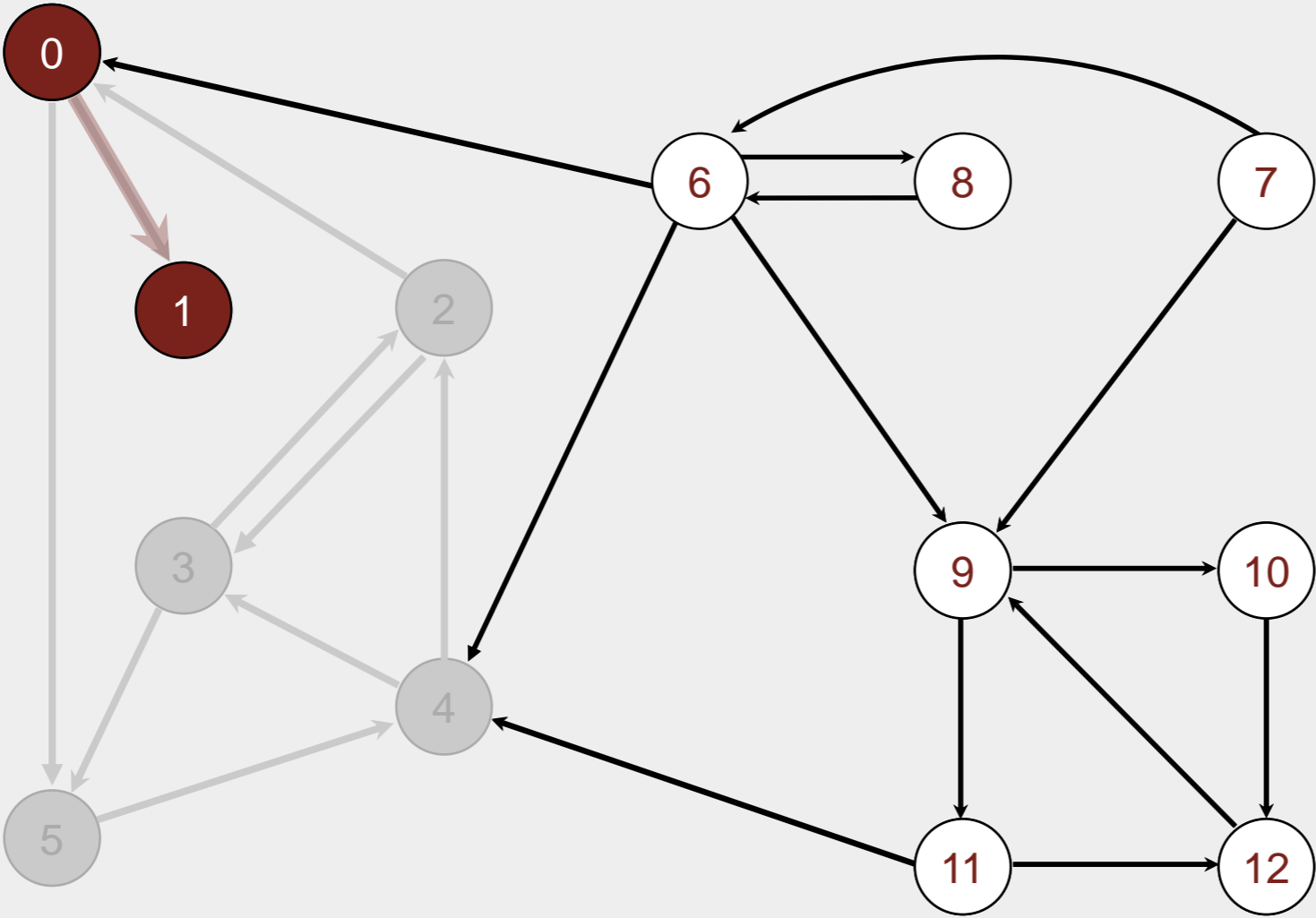
| v | marked[] | edgeTo[] |
|-----|----------|----------|
| 0 | T | — |
| 1 | | 0 |
| 2 | T | 3 |
| 3 | T | 4 |
| 4 | T | 5 |
| 5 | T | 0 |
| 6 | F | — |
| 7 | F | — |
| 8 | F | — |
| 9 | F | — |
| 10 | F | — |
| 11 | F | — |
| 12 | F | — |

visit 1

Depth-first search

To visit a vertex v :

- Mark vertex v as visited.
- Recursively visit all unmarked vertices pointing from v .



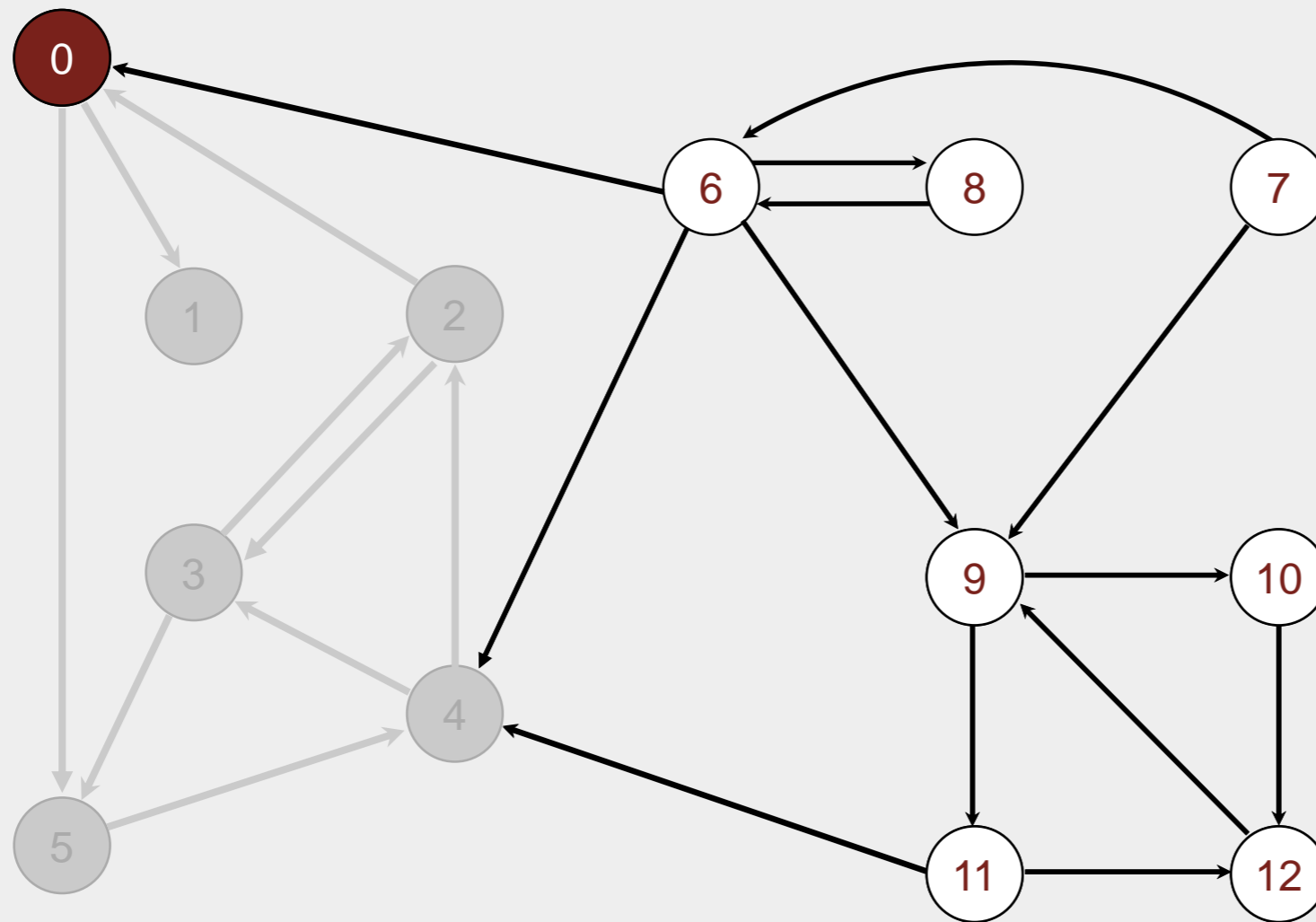
done 1

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

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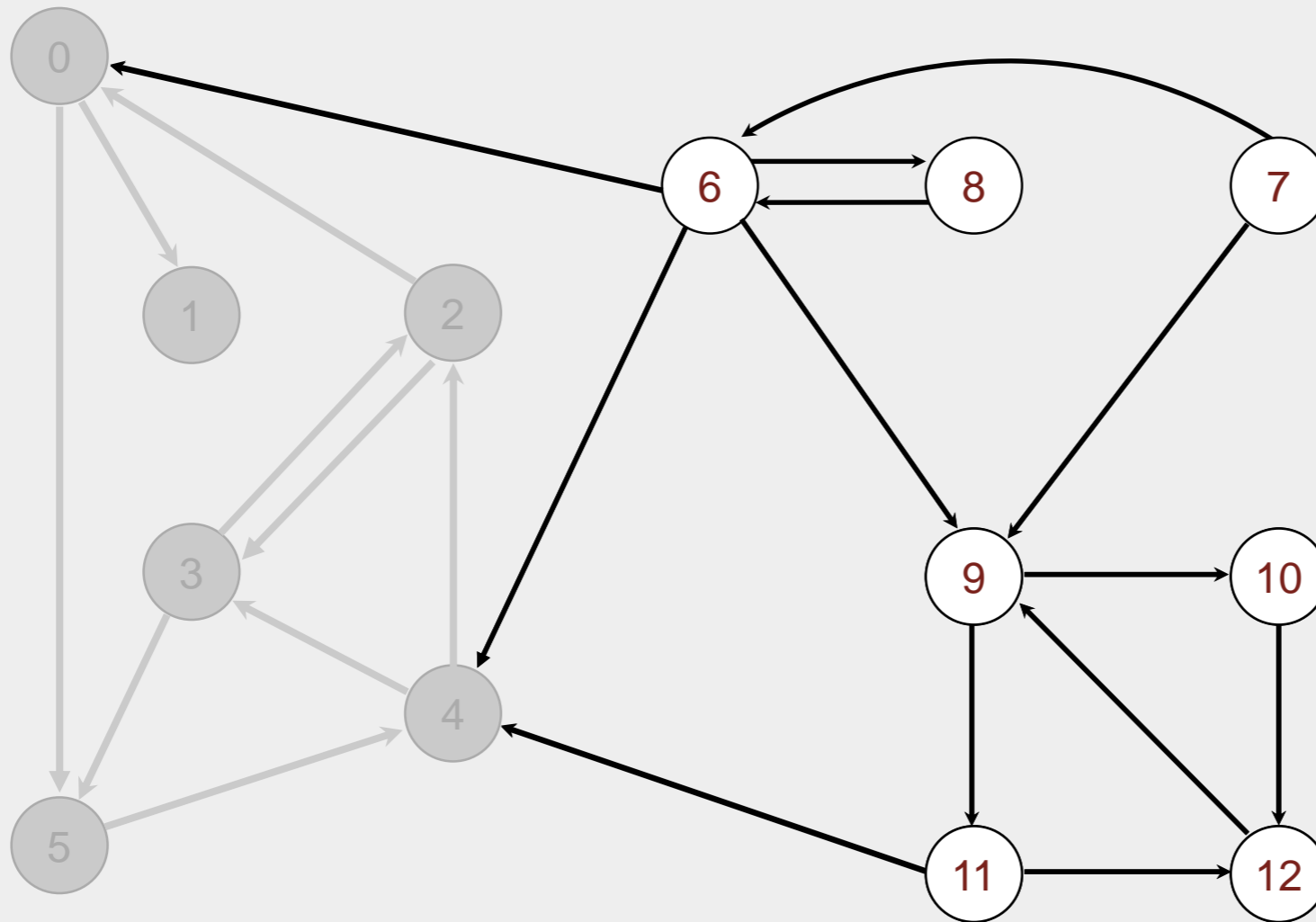
| v | marked[] | edgeTo[] |
|-----|----------|----------|
| 0 | T | — |
| 1 | T | 0 |
| 2 | T | 3 |
| 3 | T | 4 |
| 4 | T | 5 |
| 5 | T | 0 |
| 6 | F | — |
| 7 | F | — |
| 8 | F | — |
| 9 | F | — |
| 10 | F | — |
| 11 | F | — |
| 12 | F | — |

done 0

Depth-first search

To visit a vertex v :

- Mark vertex v as visited.
- Recursively visit all unmarked vertices pointing from v .



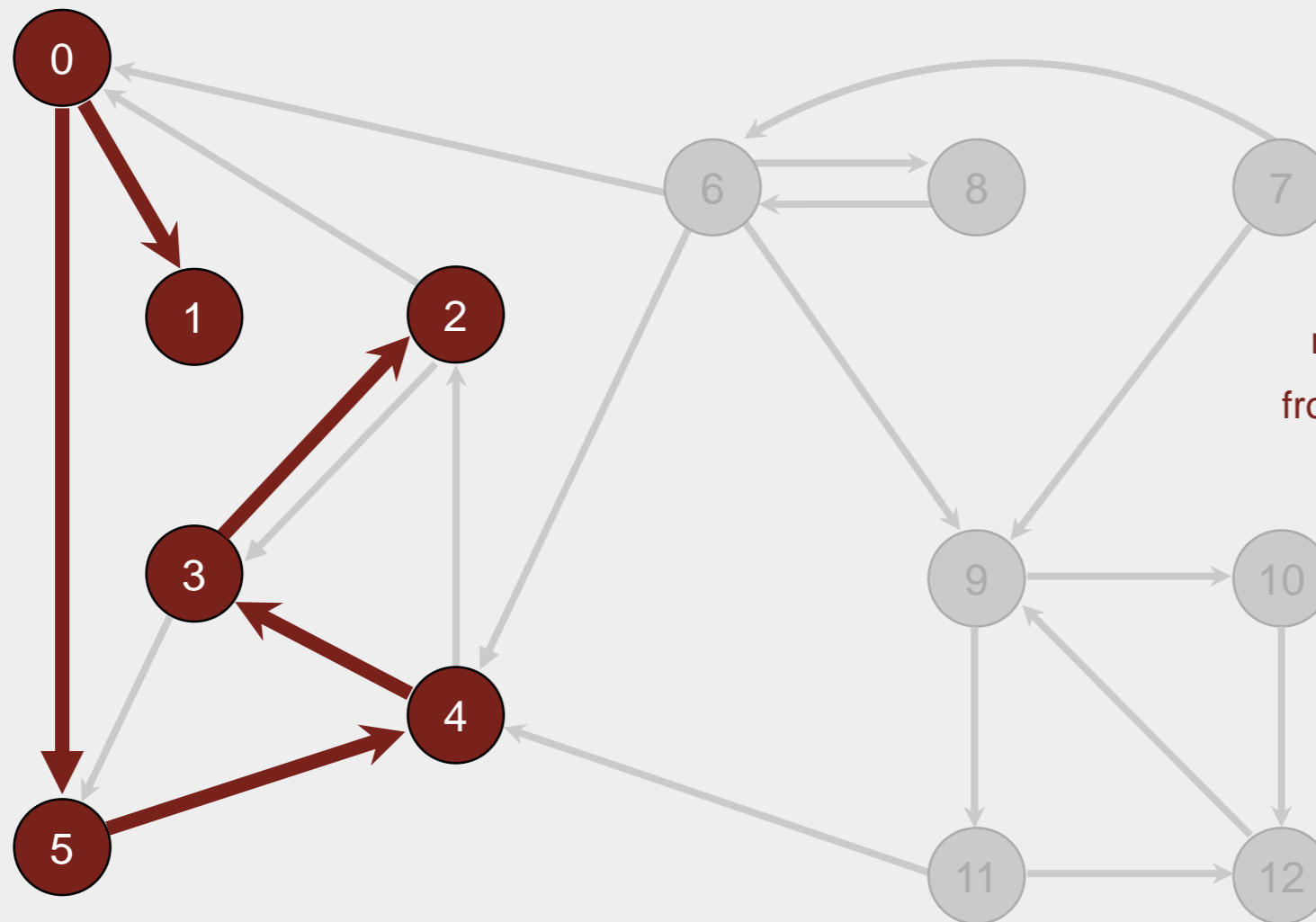
| v | marked[] | edgeTo[] |
|-----|----------|----------|
| 0 | T | — |
| 1 | T | 0 |
| 2 | T | 3 |
| 3 | T | 4 |
| 4 | T | 5 |
| 5 | T | 0 |
| 6 | F | — |
| 7 | F | — |
| 8 | F | — |
| 9 | F | — |
| 10 | F | — |
| 11 | F | — |
| 12 | F | — |

done

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