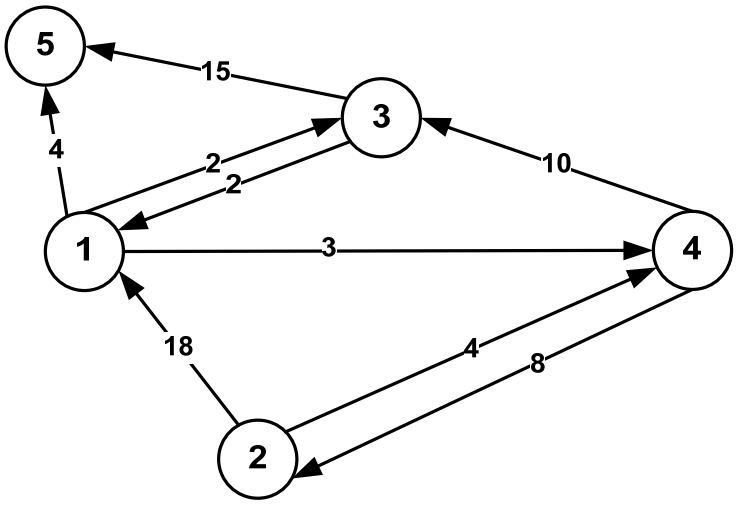
**Review Activity 16 Solutions**

## Path Finding in Graphs

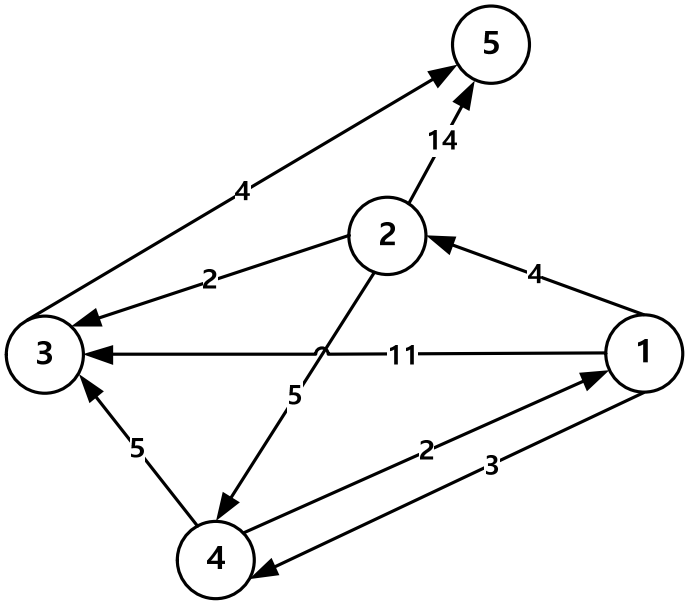
1) Consider the following weighted directed graph:




Determine the shortest paths and their associated distance costs starting from **node 2 (not node 1!)** to all the other nodes using Dijkstra's shortest-path algorithm. Show steps used in deriving your solution. When keeping track of information for each step, use the tabular format as shown in class. Also show the final shortest paths to each node (e.g., (2)-(i)-(j)).

| Iteration | V | U | C | $d_c$ | $d_1$ | $d_2$ | $d_3$ | $d_4$ | $d_5$ |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 1,3,4,5 | 2 | 0 | 18<br>(2)-(1) | 0 | ∞ | 4<br>(2)-(4) | ∞ |
| 2 | 2,4 | 1,3,5 | 4 | 4 | 18<br>(2)-(1) | 0 | 14<br>(2)-(4)-(3) | 4<br>(2)-(4) | ∞ |
| 3 | 2,3,4 | 1,5 | 3 | 14 | 16<br>(2)-(4)-(3)-(1) | 0 | 14<br>(2)-(4)-(3) | 4<br>(2)-(4) | 29<br>(2)-(4)-(3)-(5) |
| 4 | 1,2,3,4 | 5 | 1 | 16 | 16<br>(2)-(4)-(3)-(1) | 0 | 14<br>(2)-(4)-(3) | 4<br>(2)-(4) | 20<br>(2)-(4)-(3)-(1)-(5) |
| 5 | 1,2,3,4,5 | - | 5 | 20 | 16<br>(2)-(4)-(3)-(1) | 0 | 14<br>(2)-(4)-(3) | 4<br>(2)-(4) | 20<br>(2)-(4)-(3)-(1)-(5) |

2) Consider the following weighted and directed graph:




Determine the shortest paths and their associated distance costs starting from node **1** (**one**) to all the other nodes using Dijkstra's shortest-path algorithm. Show steps used in deriving your solution. When keeping track of information for each step, use the tabular format as shown in class. Also show the final shortest paths to each node (e.g., (1)-(i)-(j)).

| Iter. | V | U | C | $d_c$ | $d_1$ | $d_2$ | $d_3$ | $d_4$ | $d_5$ |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | 2,3,4,5 | 1 | 0 | 0<br>(1)-(1) | 4<br>(1)-(2) | 11<br>(1)-(3) | 3<br>(1)-(4) | ∞ |
| 2 | 1,4 | 2,3,5 | 4 | 3 | 0<br>(1)-(1) | 4<br>(1)-(2) | 8<br>(1)-(4)-(3) | 3<br>(1)-(4) | ∞ |
| 3 | 1,2,4 | 3,5 | 2 | 4 | 0<br>(1)-(1) | 4<br>(1)-(2) | 6<br>(1)-(2)-(3) | 3<br>(1)-(4) | 18<br>(1)-(2)-(5) |
| 4 | 1,2,3,4 | 5 | 3 | 6 | 0<br>(1)-(1) | 4<br>(1)-(2) | 6<br>(1)-(2)-(3) | 3<br>(1)-(4) | 10<br>(1)-(2)-(3)-(5) |
| 5 | 1,2,3,4,5 | - | 5 | 10 | 0<br>(1)-(1) | 4<br>(1)-(2) | 6<br>(1)-(2)-(3) | 3<br>(1)-(4) | 10<br>(1)-(2)-(3)-(5) |