CSE 4256: Homework 7 - Due Thursday, June 24

Complement of a Graph

The complement of a graph G is a graph H on the same vertices such that two distinct vertices of H are adjacent if and only if they are not adjacent in G. Show below is a graph G and its complement.

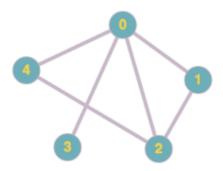


Figure 1: Graph G

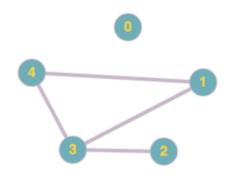


Figure 2: The complement of G

The Transpose of a Directed Graph

A directed graph is one in which the edges can be travelled in only one direction. The transpose of a directed graph G is another directed graph on the same set of vertices with all of the edges reversed compared to the orientation of the corresponding edges in G.

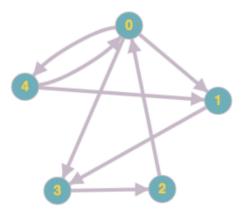


Figure 3: A directed graph G

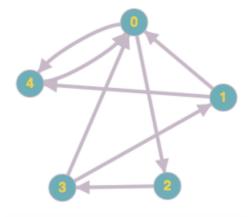


Figure 4: A directed graph G

Homework

Question 1:

Write a method called **complementw1(m)** that takes an adjacency-matrix representation of an undirected graph as an argument, and returns a matrix representing its complement. For example, for the matrix:

```
[[0, 1, 0, 0],
[1, 0, 0, 1],
[0, 0, 0, 1],
[0, 1, 1, 0]]
```

The method should return:

```
[[0, 0, 1, 1],
[0, 0, 1, 0],
[1, 1, 0, 0],
[1, 0, 0, 0]]
```

Question 2:

Write a method called **complement2(g)** that takes an adjacency-list representation (i.e. a dictionary) of an undirected graph as an argument, and returns an adjacency-list representing its complement. For example, for the dictionary:

```
g = {0: [1, 2, 4],
1: [0, 2, 4],
2: [0, 1, 3],
3: [2, 4],
4: [1, 3]}
```

The method should return:

```
g = {0: [3],
1: [3],
2: [4],
3: [0, 1],
4: [0, 2]}
```

Question 3:

Write a method called **transpose1(m)** that takes an adjacency-matrix representation of a directed graph as an argument, and returns a matrix representing its transpose. For example, for the matrix:

```
[[0, 1, 0, 1],
[0, 0, 1, 0],
[1, 1, 0, 1],
[0, 1, 1, 0]]
```

The method should return:

```
[[0, 0, 1, 0],
[1, 0, 1, 1],
[0, 1, 0, 1],
[1, 0, 1, 0]]
```

Question 4:

Write a method called **transpose2(g)** that takes an adjacency-list representation (i.e. a dictionary) of a directed graph as an argument, and returns an adjacency-list representing its transpose. For example, for the dictionary:

```
g = {0: [1, 2, 4],
1: [0, 2, 4],
2: [0, 1, 3],
3: [2, 4],
4: [1, 3]}
```

The method should return:

```
g ={0: [1, 2],

1: [0, 2, 4],

2: [0, 1, 3],

3: [2, 4],

4: [0, 1, 3]
```

What to Submit

Submit your Python file on Carmen.