This quiz has 3 questions, for a total of 10 points.

1. [4 points] Fill in the blanks to complete this implementation of a adjacency list representation of an undirected graph.

```python
class UndirectedAdjList:
    def __init__(self, num_vertices):
        self.array = [___(a)___ for i in range(0,num_vertices)]
        # add edge {u,v} to the graph
    def add_edge(self, u, v):
        self.array[u].append(v)
        ___(b)___
    # return the list of vertices adjacent to vertex u
    def adjacent(self, u):
        return ___(c)___
    # return True if the edge is in the graph, False otherwise
    def find_edge(self, u, v):
        for w in self.array[u]:
            if ___(d)___:
                return True
        return False
```

Solution:

(a) []
(b) self.array[v].append(u)
(c) self.array[u]
(d) w == u

2. [3 points] Identify a breadth-first tree rooted at node g in the following directed graph by drawing dark lines over the edges in the breadth-first tree.

```
 a --- b  c --- d
   |    |    |
   |    v    |
   |    e --- f --- g
   |     |   |
   |     v   |
   v     |   |
 i     j     k --- l
```

Solution: One of the possible solutions:

```
 a --- b  c --- d
   |    |    |
   |    v    |
   |    e --- f --- g
   |     |   |
   |     v   |
   v     |   |
 i     j     k --- l
```
3. [3 points] Identify a depth-first tree rooted at node $g$ in the following directed graph by drawing dark lines over the edges in the depth-first tree.

```
a ← b ← c → d
  ↓    ↓    ↓
  e ← f ← g    h
  ↓    ↓    ↓
  i    j ← k → l
```

**Solution:** One of the possible solutions:

```
a ← b
  ↓
  c ← d
  ↓
  e ← f ← g    h
  ↓    ↓    ↓
  i    j ← k → l
```