family name _____ given name _____ ID _____

quiz3 2013nov8 c204 **10marks 30min** **no electronic devices**

```
G = {'A':['E','I'],
     'B':[],
     'C':['D','E','F'],
     'D':['H'],
     'E':['G'],
     'F':['C','D'],
     'G':['B','C'],
     'H':['B','F'],
     'I':['A','D']}
```

1. For the above digraph, list the vertices in breadth-first order, starting from A, and for each vertex give its distance from A.

2. Draw the digraph, list the vertices in postorder, and identify the strongly connected components.

3. For the digraph, either give a topsort, or justify with details why there is none.

```
...                                    #    A  B  C  D  E
while not empty(PQ):                   # A                6  3
  v = removemin(PQ)                    # B           7    1
  for all w in G[v]:                   # C  1  1          1  1
    if dist[w] > dist[v] + L[v,w]:     # D           5       3
      blah blah blah                   # E  1  1     9    8
```

4. Above is part of the pseudocode from Dijkstra's algorithm, and the L-values of a digraph, e.g. row C, column A shows `L[C,A]=1`. The algorithm executes with start vertex A. Show the final `dist` and `prev` values.

	A	B	C	D	E
`dist`					
`prev`					

5. Assume Dijkstra's algorithm runs on a digraph represented with an adjacency matrix, and with the priority queue implemented by a heap. In terms of the number of vertices n and arcs m, give the runtime using big-O notation. Justify briefly.