Homework 7

1. **Write BFS and DFS for a graph:** What would be BFS and DFS traversal for the below graphs. Write the nodes for BFS and DFS. Start at node A.

   (Note that there are other possibilities, these are just one)

   **BFS:** A, B, D, G, F, C, E

   **DFS:** A, B, G, F, C, D, E

2. **Apply BFS/DFS to solve a problem**

   You are given a 3-D puzzle. The length and breadth of the puzzle is given by a 2D matrix puzzle[m][n]. The height of each cell is given by the value of each cell, the value of puzzle[row][column] give the height of the cell [row][column]. You are at [0][0] cell and you want to reach to the bottom right cell [m-1][n-1], the destination cell. You can move either up, down, left, or right. Write an algorithm to reach the destination cell with minimum effort. How effort is defined: The effort of route is the maximum absolute difference between two consecutive cells.

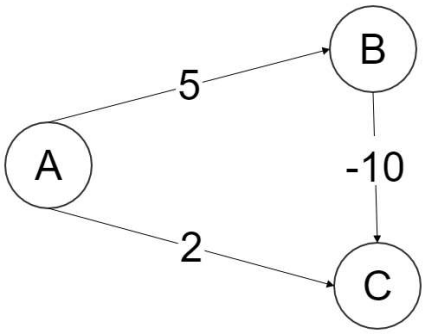
   a. Implement the algorithm. Name your function **minEffort(puzzle)**; puzzle will be in the form of an 2D matrix as shown in the above example. Name your file **MinPuzzle.py**

      On Gradescope

   b. What is the time complexity of your implementation?

      O((V+E)logV)

3. **Analyze Dijkstra with negative edges:** Analyze with a sample graph and show why Dijkstra does not work with negative edges. Give the sample graph and write your explanation why Dijkstra would not work in this case.




This is an example of a graph with a negative edge. Let's say we start at A and are trying to find the shortest path to C. Using Dijkstra's algorithm, it would look at options A->C with a cost of 2 and A->B with a cost of 5. The algorithm would see that A->B costs more and would assume that B->C would cost even more than 5. Therefore, it would choose the path A->C with a cost of 2, not finding that A->B->C would actually cost less.

4. **(Extra Credit): What would be the BFS and DFS traversal in below puzzle. Start at node A.**

   (Note that there are other possibilities, these are just one)

   **BFS:** A, B, C, D, E, G, F, I, H, J

   **DFS:** A, B, C, D, G, F, H, I, J, E