**Problem 1.** *Here's the Washington, DC, metro system. Think of it as a graph whose vertices are the stations, with edges between stations that are connected by at least one rail line.*


*(a) What valence do most stations have?*

*(b) How many stations have valence 3?*

*(c) Which stations have valence 5?*

*(d) Starting at the Pentagon station (just left of the river), how many stations can you get in at most 5 stops?*

*(e) What is the shortest cycle in this graph?*

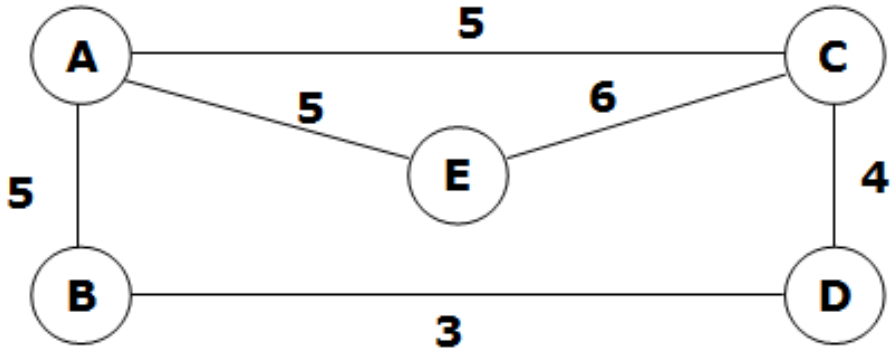
**Problem 2.** *Here are some Western states:*


*(a) Draw the adjacency graph for this map. That is, replace each state with a vertex, and connect the vertices if the corresponding states touch.*

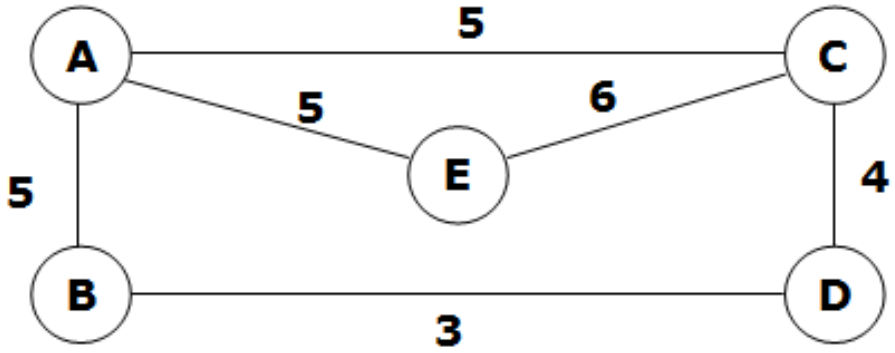
*(b) Compute the valence of each vertex in your graph. What does it mean in terms of the map?*

*(c) Is it possible to start in some state, cross each border exactly once, and return home? If so, draw your path on the map. If not, convince me you're right.*

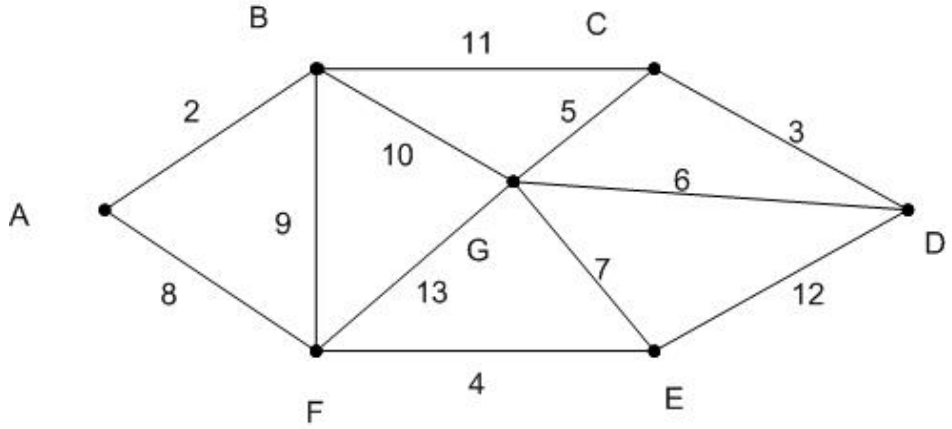
**Problem 3.** *Use Dijkstra's algorithm to find the distance from A to D:*




**Problem 4.** *Use Dijkstra's algorithm to find the distance from B to C:*




**Problem 5.** *Use Dijkstra's algorithm to find the distance from B to E:*



**Problem 6.** *Think of the "friends graph" for people in our class, where people become vertices, and there's an edge between two people if they are friends.*

*(a) Is the friends graph connected?*

*(b) What does having a really high valence mean in terms of people?*

**Problem 7.** *Google's PageRank algorithm analyzes the significance of web pages by looking at how they are connected to each other. If we want to make a graph whose vertices are web pages, what should the edges be?*

**Problem 8.** *How many edges are there in a complete graph with 6 vertices?*