

Name: Solutions score: _____ / 10

There are 10 points possible on this quiz. No aids (book, notes, etc.) are permitted. You may use a calculator. **Show all work and supporting calculations for full credit. Explain how you get your answers.**

1. (2 points)

- (a) Describe a situation that can be modeled with a graph. What do the vertices represent? What do the edges represent?

Vertices: *people*

Edges: *Two people have an edge between them if they have a class together.*

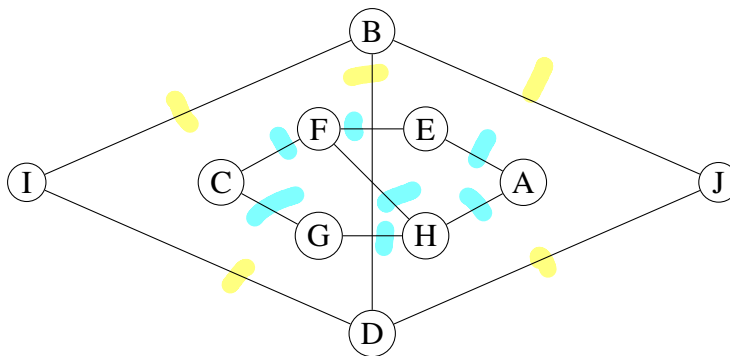
- (b) Describe a situation that can be modeled with a **weighted** graph. What do the vertices represent? What do the edges represent? What do the weights represent?

Vertices: *cities*

Edges: *Two cities have an edge between them if there is a direct flight between them.*

Weights: *The duration of the flight.*

2. (3 points) Consider the following graph:



- (a) How many vertices does this graph have? 10
- (b) How many edges does this graph have? 12
- (c) Explain why this graph is not connected.

There is no path from vertex A to vertex B.

3. (5 points) Recall Dijkstra's algorithm says the following:

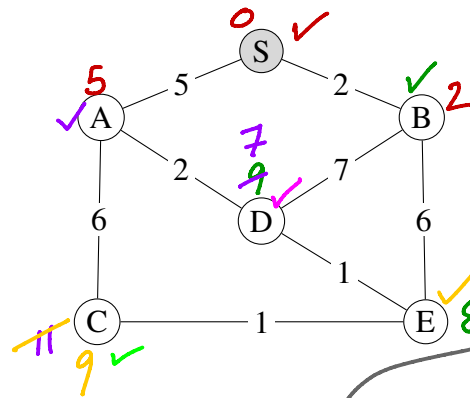
Dijkstra's Algorithm

input: a graph with distances (weights) on the edges and a starting vertex, say s

output: the shortest distance between s and every vertex in the graph

rough strategy: All vertices get **tentative** distances to vertex s . One-by-one, vertices are explored and tentative distances are updated until minimum distances are obtained. Break ties alphabetically.

Use Dijkstra's algorithm to determine the distances between vertex S and each other vertex. Clearly show the steps of the algorithm in the space provided.



Note: A correct implementation will have these values marked out.

| | Explored? | vertices | tentative distances |
|-----------------|-----------|----------|---------------------|
| 1 st | ✓ | S | 0 |
| 3 rd | ✓ | A | ∞ 5 |
| 2 nd | ✓ | B | ∞ 2 |
| 6 th | ✓ | C | ∞ 11 9 |
| 4 th | ✓ | D | ∞ 9 7 |
| 5 th | ✓ | E | ∞ 8 |

| vertex | minimum distance to S |
|--------|-----------------------|
| S | 0 |
| A | 5 |
| B | 2 |
| C | 9 |
| D | 7 |
| E | 8 |