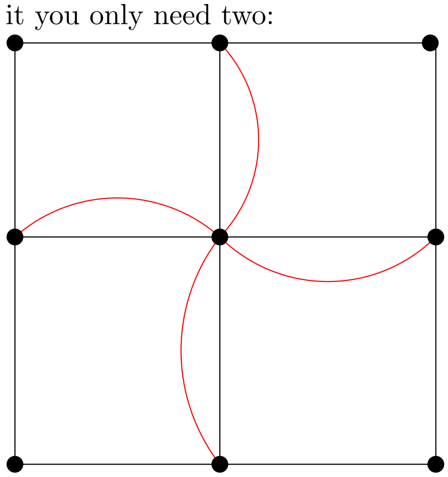
1. True/False: T, F, T, F, T, F, T, F.

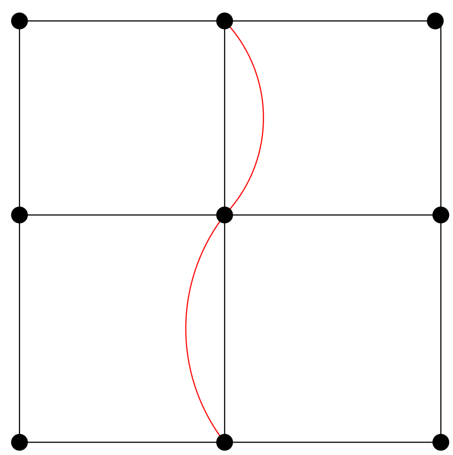
I intended for the answer to (g) to be True, but without the assumption that the graph is connected, it's false. This never occurred to me, because we never talked about Eulerizing except for connected graphs. But the word "connected" (or lack of it) was important for (b), so I'd better be consistent. If you marked False for (g) make sure you bring it to me and get your three points back!

2. Multiple Choice: c, a, b, d, a, b, d, a, c, d.

3. "Eulerizing" means you add copies of *existing* edges until every vertex has an even degree. (This means the resulting graph will have an Euler Circuit.) "Semi-Eulerizing" means you add copies of existing edges until exactly *two* vertices have an odd degree. (This means the resulting graph will have an Euler Path.).

In this case, you could Eulerize the graph by adding copies of four edges; to Semi-Eulerize it you only need two:





3. Using the Nearest Neighbor Algorithm stating at B, you should get the following circuit:

B, A, D, E, C, B. Total Weight is 23.

To do the Repetitive Nearest Neighbor, you do the Nearest Neighbor starting at each vertex, and see which one gives you the best circuit. Since there are 5 vertices, you need to do the Nearest Neighbor Algorithm 5 times. (Or 4 more times, since you already did it once.)

Using the Cheapest Link Algorithm, you would choose edges in the following order:

AB (weight 1)
BD (weight 2)
DE (weight 3)
CE (weight 4)
AC (weight 15)

If you draw this out and write the circuit starting at A, you'll get

A,B,D,E,C,A or A,C,E,D,B,A.

In either case the total weight is 25.

Using the Repetitive Nearest Neighbor Algorithm, you'll get a circuit with weight of 23 or less. (You found a circuit of weight 23 above; it's possible you might find one that's even better if you do Nearest Neighbord starting at a different vertex.) Since the weight of the Cheapest Link Circuit is 25, the Repetitive Nearest Neighbor Algorithm does a better job with this graph.

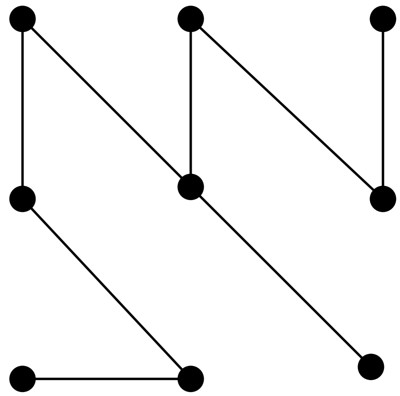
5. First line, left to right:

- No - the shortest network here would put a Steiner Point in the middle of the triangle.
- No - the angle is more than 120 degrees, so we can't do any Steiner Points here. But then the shortest network would be the Minimum Spanning Tree (MST). In this case the MST would be the top two edges of the triangle, because those are the two shortest edges. (The bottom edge is really long.)

Second line, left to right:

- Yes - for a rectangle like this, the shortest network has two Steiner Points, as far away as possible.
- No - if you're going to add any new interior point to create a shortest network, then they need to be Steiner Points. A Steiner Point is a three-way interesection, not a four-way intersection.

6. Here's the minimum spanning tree:



A current version of these solutions is available at http://www.math.umn.edu/∼rogness/math1001/
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