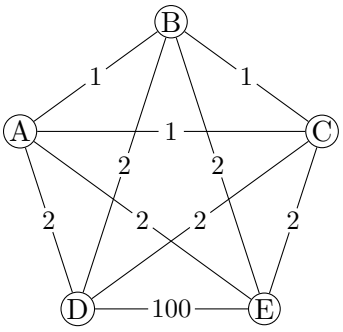
Math F113X: Homework Set 7

- **Section:** Graph Theory
  Topic: Algorithms for finding Hamiltonian circuits
  # 19*, 22*, A, B, C

  * In part b of both of these problems, you should complete Nearest Neighbor on **TWO** additional vertices. After that, you can use the solutions to determine which vertex gives a minimum for this algorithm.

- **Section:** Scheduling
  Topic: Introduction to Scheduling
  #1, 2, 3, 6

Problem A: Answer questions about the graph below.



1. Apply the Repeated Nearest Neighbor Algorithm and determine the weight of the resulting circuit. (Note that you are allowed to use symmetry in the graph to make this faster!)
2. Apply the Sorted Edges Algorithm and determine the weight of the resulting circuit.
3. Using your own judgment, find a minimum weight Hamiltonian circuit.
4. Does either algorithm – Repeated Nearest Neighbor or Sorted Edges – return a minimum weight Hamiltonian circuit?

Problem B: Create weighted, complete 5-vertex graph with vertex set A, B, C, D, and E, such that the Nearest Neighbor algorithm starting at A will give an optimal solution but starting at B will give the worst possible solution. Show your answer is correct.

Problem C: Suppose someone wants to visit the capital city of every state in the contiguous 48 states and Washington DC. So, they will visit 49 cities in total. [NOTE: you will need to use a computational tool, like WolframAlpha, to complete this problem.]

1. Suppose they want to start and end the 49-city-tour at the same place. How many different tours are possible? (Your answer should be in both factorial notation and in scientific notation.)
2. Suppose you have a computer that can calculate the length of 1000 49-city-tours in one second. How long would it take the computer to calculate the length of all possible 49-city-tours? Give your answer in years.
3. What does your answer in part 2 indicate about the Brute Force algorithm?

Remember to write up your homework solutions according to the homework writeup guidelines.

Homework is graded using the following rubric for each problem (or problem part):

2 points: You provided a complete answer, with supporting work, written up clearly

1 point: Some attempt at a solution, but incomplete writeup / unclear / illegible / no answer

1 point: Only an answer, with no supporting work

0 points: Missing.

After you do the homework, you need to check your answers against the solutions! Then figure out your errors (if any) and revise your homework before you submit it.

Homework must be submitted on Gradescope.