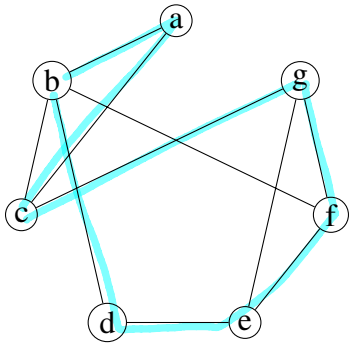
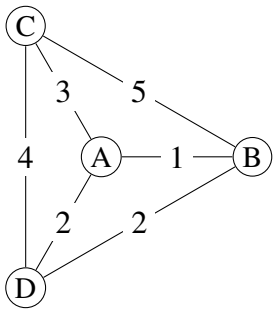
MATH F113X: Three Hamiltonian Circuit Algorithms

Two Distinct Questions



existence?
Does G have a Hamiltonian circuit?



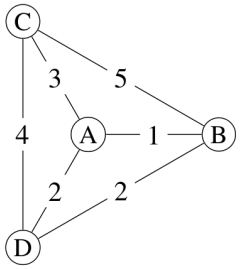
Smallest weight?
The three algorithms are focused on this question.

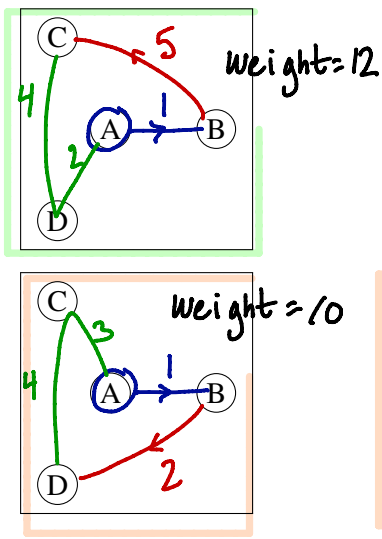
→ Down side?? A lot to check....

~~Brute Force Algorithm~~

1. Check the weight of every possible Hamiltonian circuit.
2. Pick one with smallest weight.

Example Be systematic





ANSWER: Min. wgt circuit is ABDCA of weight 10.

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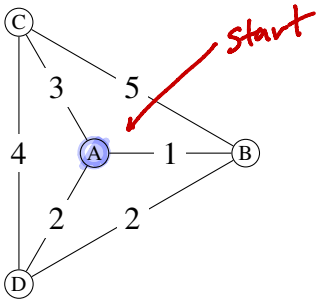
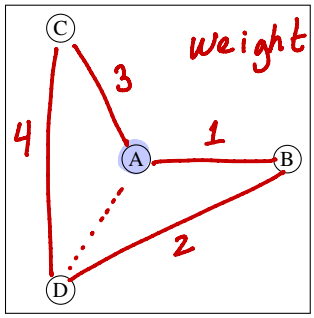
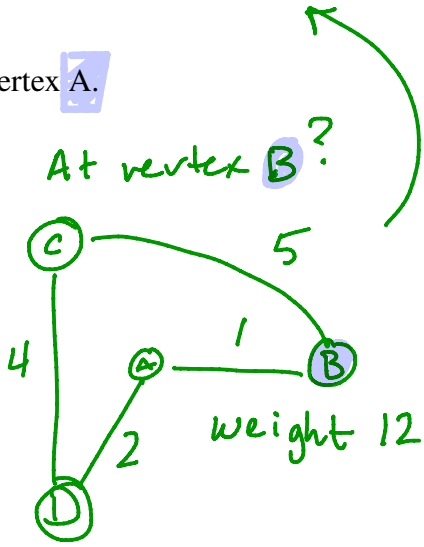
Nearest Neighbor Algorithm (NNA) (Given a start vertex.)

- Choose closest vertex provided it doesn't close the circuit too soon.
- It's NOT guaranteed to obtain the shortest Hamiltonian circuit.

On the graph below, complete nearest neighbor starting with starting vertex A.



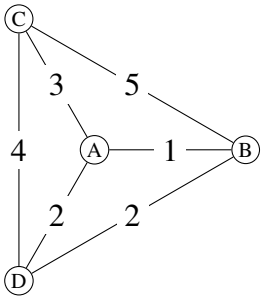


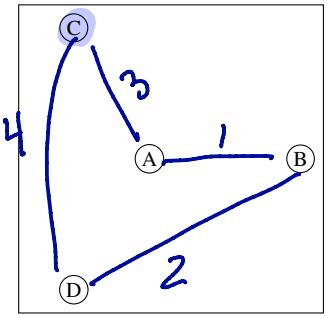


Repeated Nearest Neighbor Algorithm (RNNA)

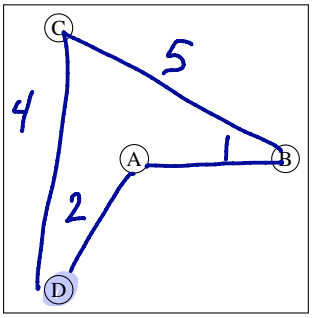
- Complete NNA from every vertex.
- Hope to increase our chances of hitting on an optimal circuit.

On the graph below, complete the Repeated Nearest Neighbor.





wgt: 10



wgt: 12

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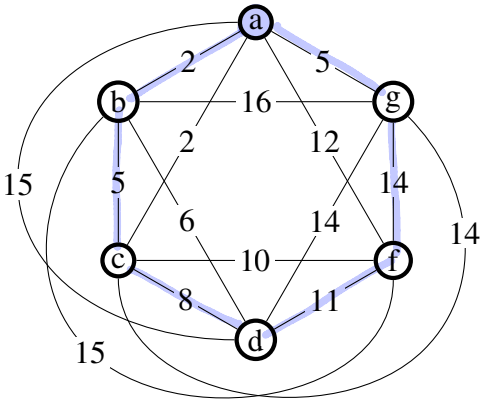
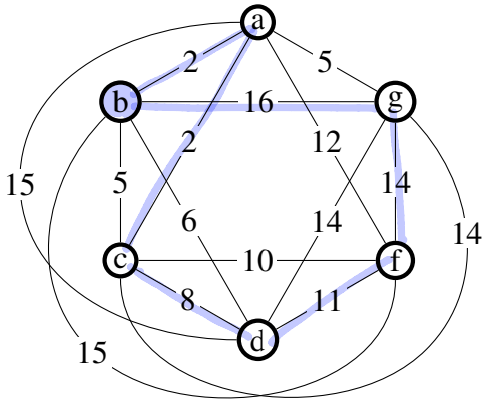
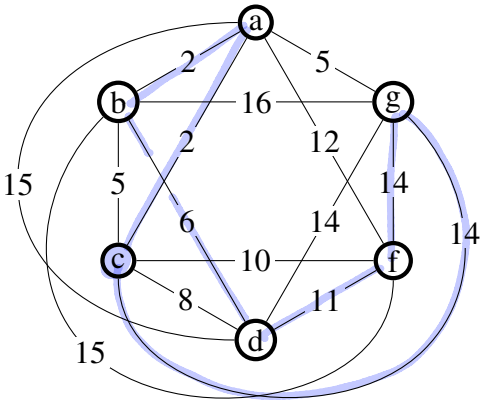
Complete Repeated Nearest Neighbor on the graph below. (Suggestion: Use parallel processing)



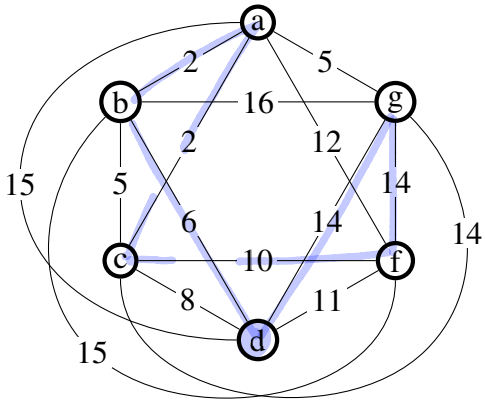
weight = 45



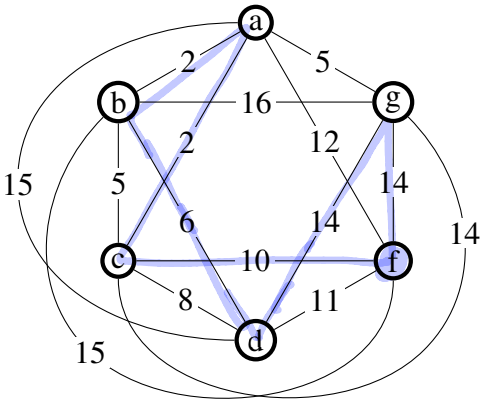
weight = 53



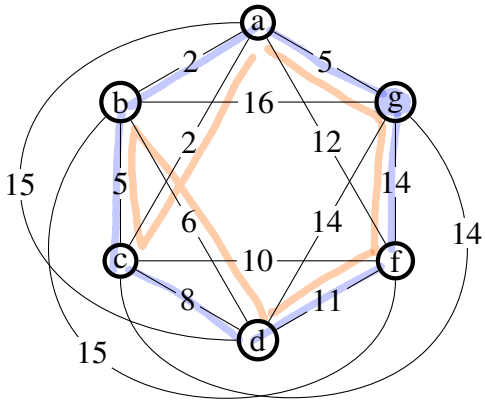
weight = 49



weight = 48



weight = 48



weight = 45

Best circuit using RNNA: abcdfg, wgt 45

Conclusion: Actually a minimum? No, acbdfg, wgt 43