Homework problems: Chapter 11 (The Efficiency of Algorithms)

Problem 1:
Starting at location A what is the shortest path to visit the rest of the points: B, C, D, E?
Notice, there is (n-1)! possible permutations for paths.

Problem 2:
Suppose that you want to calculate the traveling salesman problem starting at any location, for 10 locations. The program rigorously calculates each possible path.
   a) How long does it take if a basic operation is .00001 seconds?
   b) Now suppose you start over but this time you have one hour of computational time available. How many more locations can be included beside the initial 10?
      Assume a basic operation is .00001 seconds as before.

Problem 3:
Find an efficient algorithm for the number guessing game\(^1\). What is the O notation for it?

Problem 4:
Is the integer guessing problem in NP? Is it in P? Be sure to explain & justify for full credit.

Problem 5:
A company wants to make a production run of widgets and doodads. They have rented the factory for 3000 hours and it takes 5 hours to make a widget and 1 hour for a doodad. Furthermore, the company has enough material to make 1000 combined widgets and doodads. How many widgets and doodads should the company make to maximize profit if it nets twice as much on a widget than it does a doodad?
Guess an integer between 1 and n. with each incorrect guess, a friend says either "too high" or "too low".

**Senior Project Ideas**

1. Make a self organizing neural network that solves a traveling salesman problem

2. Investigate the use of the simplex algorithm for non-convex polytopes

3. Investigate the differences between complexity classes for that of classical computing and quantum computing