SPRING 2012: **COT 6936** Topics in Algorithms
[Homework 0; No need to submit solutions]

The purpose of this homework is to give you an opportunity to revise materials from your earlier course on "Introduction to Algorithms". You are not expected to turn in solutions to this homework. Nevertheless, it may stillbe a good idea for you to write down formal solutions.

Problems

1. In class, we discussed two versions of the problem on achieving diversity in heights in a class. The problems reduced to that of finding the largest/smallest empty range in a sequence of sorted heights. Thus both problems are only as hard as sorting. Yet, you were told in class that one of them is harder than the other. Which is harder? Prove your answers.

2. How many bit changes occur in the binary counter when counting from 0 to n?

3. A ship arrives at a port. Forty sailors go ashore for revelry. They return to the ship rather inebriated. Being unable to remember their cabin location, they find a random unoccupied cabin to sleep the night. How many sailors are expected to sleep in their own cabins?

4. Show that 2SAT is in $\mathcal{P}$.

5. The following are some problems from the ACM Programming Competitions. They test your knowledge of material from the introductory algorithms course, especially your knowledge of basic algorithmic paradigms (divide-and-conquer, greedy algorithms, and dynamic programming) and data structures.

   (a) Robot Challenge Problem:
   http://www.cs.fiu.edu/~giri/teach/6936/S10/SER2009_RobotChallenge.pdf

   (b) Frequency Count Problem:
   http://cs05.informatik.uni-ulm.de/acm/Locals/2007/html/frequent.html

   (c) Profits:
   http://www.cs.fiu.edu/~giri/teach/6936/S12/SER_2010_Profits.pdf

   (d) Family Fortune (see Problem H. from the problem set):
   http://www.cs.fiu.edu/~giri/teach/6936/S12/SER_2011_AllProblems.pdf

6. Listen to Cool MP3:
   http://www.cs.princeton.edu/~wayne/kleinberg-tardos/longest-path.mp3