1. [50 pt] Write a program to solve the traveling salesperson problem using depth-first search and backtracking.

2. [25 pt] Develop a nondeterministic algorithm of complexity $O(n)$ to determine whether there is a subset of $n$ numbers $a_i$, $1 \leq i \leq n$, that sums to $m$. Assume that the set $a_1, \ldots, a_n$ is given.

3. [25 pt] Show that the knapsack optimization problem reduces to the knapsack decision problem when all the $p$'s, $w$'s, and $m$ are integer and the complexity is measured as a function of input length.

   Hint: If the input length is $q$, then $\sum p_i \leq n2^n$, where $n$ is the number of objects. Use a binary search to determine the optimal solution value.

**What to handin**

Hand in a hardcopy of all the sources, readme, makefile(s), and results. Create your programs in a directory called `username.6` where `username` is your login name on admiral. Once you are done with everything, remove the executables and object files, and issue the following commands:

```
% cd
% ~bhatias/bin/handin cs5130 6
```