# Basic Algorithms, Assignment 8

Due, Thursday, Nov 8

**SINKING SHIP?** Monday, November 5, 2007 is the LAST DAY for undergraduate students to withdraw from a course.
**HONORS PROJECT:** To receive Honors Credit students must complete an honors project. Please contact Prof. Spencer for possible projects.

1. Page 189, Problem 2

2. `Computer Experiment:` Implement either Dijkstra's Algorithm or Prim's Algorithm or Kruskal's Algorithm. You cannot use a canned program but must write it from scratch in the language of your choice. (It is OK if stacks and arrays are built in.) Apply it to the following random data: The graph is the complete graph on $n$ vertices (for Dijkstra we assume an undirected graph) and the costs $c[i,j]$ are independent uniformly random (use standard code for this) real numbers in $[0,1]$. (For Kruskal you can use a canned sort to order the costs.) For Kruskal or Prim let $T$ be the total length of the tree created. For Dijkstra, let vertex 1 be the source and let $T$ be the number of times $d[2]$ changes during the algorithm. Run the algorithm several times for $n = 50, 100, 200, 500$. Plot the average value of $T$ as a function of $n$. From the data (taking more data if you wish) come up with a conjecture of how $T$ behaves as a function of $n$. `Notes:` This can be done in groups of at most three students and handed in jointly. You **MUST** give copious explanations, either in comments on the program itself or on a side sheet, of what you are doing.

   Among his co-workers in an Indian named Ganapathy. Ganapathy often arrives late to work; on some days he does not come at all. When he does come, he does not appear to be working very hard; he sits in his cubicle with his feet on the desk, apparently dreaming. For his absences he has only the most cursory of excused ("I was not well") Nevertheless he is not chided. Ganapathy, it emerges, is a particularly valuable aquisition for International Computers. He has studied in America, holds an American degree in computer science.
   J.M. Coetzee, *Youth*