COP 4600 - Homework 2
Due November 15, 2012 (100 + 10 bonus points)

Problem 1: (50 pts)
This problem requires you to complete a multithreaded program sorting files. Download the zip file from the web page, and follow the instructions in Readme.txt

Problem 2: (15 pts)
Consider an environment in which there is a one-to-one mapping between user-level threads and kernel level threads that allows one or more threads within a process to issue blocking system calls while other threads continue to run. Explain why this model can make multithreaded programs run faster than their single-threaded counterparts on a uniprocessor computer.

Problem 3: (15 pts)
In many aspects, multiprogramming (running multiple programs on single processor machines) and multiprocessing (running multiple programs on multiple processors) create the same problems with respect to concurrency. However, there are some differences as well. Describe two of them.

Problem 4: (30 pts)
This problem demonstrates the use of semaphores to coordinate three types of processes. Santa Claus sleeps in his shop at the North Pole and can only be wakened by either:
- All nine reindeer being back from their vacation in the South Pacific or
- Some of the elves having difficulties making toys.

To allow Santa to get some sleep, the elves can only wake him when three of them are having problems. When three elves are having their problems solved, any other elves wishing to visit Santa must wait for those elves to return. If Santa wakes up to find three elves waiting at his shop's door, along with the last reindeer having come back from the tropics, Santa has decided that the elves can wait until after Christmas, because it is more important to get his sleigh ready. (It is assumed that the reindeer do not want to leave the tropics, and therefore stay there until the last possible moment). The last reindeer to arrive must get Santa while the others wait in a warming hut before being harnessed to the sleigh.

Solve this problem using semaphores.