CS 185	Homework #2	Assigned April 27, 1999
Spring 1999		Due: May 7, 1999

1. Construct an instance for $P|pmtn|C_{\max}$ for which an optimal schedule has at least $m-1$ preemptions.

2. Show that Integer Linear Programming is NP-hard.

3. Consider the one variable linear program linear program (P)
maximize tx
subject to
$rx \leq s$
$x \geq 0$
where r ,s, and t are arbitrary real numbers. Let D be the dual of P.
For which values of r,s and t, can you assert that
a) both P and D have optimal solutions.
b) P has a feasible solution and D has no feasible solution
c) D has a feasible solution and P has no feasible solution
d) neither P nor D have feasible solutions.

4. Sometimes we may wish to just find a feasible solution to a set of linear inequalities. In other words, we may have m inequalities:

$$\sum_{i=1}^{m} a_{ij}x_i \leq b_i, \quad i = 1, \ldots, m$$

and we wish to find values for the x_i that satisfy all the inequalities. Show that this problem is equivalent to linear programming. That is, first show that if you have an algorithm to solve a linear program, then you can find a feasible solution to a set of linear inequalities (this is easy), and then show that if you have an algorithm to find a feasible solution to a set of linear inequalities then you can use it to solve a linear program. (this is not as easy. Hint: it helps to use both the primal and the dual)

5. Give a polynomial time algorithm to solve the problem $R||C_{\max}$ when all the processing times p_{ij} are either 1 or 2.

6. Give a polynomial-time algorithm for $1|r_j, p_1 = 1|L_{\max}$. Make the running time of the algorithm as small as possible.

7. Give a polynomial time algorithm to solve the problem $R|pmtn|L_{\max}$. (Hint: It is similar to $R|pmtn|C_{\max}$, but you may need more variables.)