1.224J Carrier Systems
Problem Set 1, due 11/5/2003

(Adapted from Introduction to Optimization , Bertsimas, Tsitsiklis pb 5.7)

DATA:
A paper company manufactures 3 basic products:
   a) pads,   -consists of a single pad of 25 sheets of lined paper.
   b) 5-pack   -consists of 5 pads of paper + small notebook
   c) 20-pack.   -consists of 20 pads of paper + large notebook

The small and large notebook are not sold separately.
a) The following are required for the production of each of the above:

Pad of paper:
1 minute of paper machine time,
1 minute of supervisory time, and
$1 in direct costs.

Small notebook:
2 minutes of paper-machine time,
45 seconds of supervisory time and
$2 in direct cost.

Large notebook:
3 minutes of paper machine time,
30 seconds of supervisory time, and
$3 in direct costs.

b) The packaging requirements are as follows:
5-pack:
1 minute of packager's time, and
1 minute of supervisory time.

20 pack:
3 minutes of packager's time and
2 minutes of supervisory time.

The amounts of available paper-machine time, supervisory time, and packager's time are constants b1, b2, b3, respectively (B1= 165 min; b2=150 min; b3=15 min).

Any of the three products can be sold to retailers in any quantity at the prices of $3, $16, and $70 respectively.

QUESTIONS:

1) Provide a LP of the problem of determining the optimal mix of the three products. Ignore the constraint that quantities need to be integer.
2) Solve the LP using Excel Solver.
3) What is the marginal value of an extra unit of supervisory time?
4) The company is thinking of buying an additional paper machine to increase its paper machine resource time. Should it buy it, and if so, how much should it pay for the additional machine?
5) How should the company price its 5-pack product in order to make it attractive to produce it?