

MthSc 440/640 Problem Set #1

Due 1/20/12

1. A farmer has 400 acres available to plant corn, wheat, or soybean. He can harvest 10 bushels of corn per acre, 15 bushels of wheat per acre, and 20 bushels of soybean per acre. Each acre planted with corn requires 5.5 pounds of fertilizer and 4 hours of labor; wheat requires 6.0 pounds of fertilizer and 3.5 hours per acre; soybean requires 4.5 pounds of fertilizer and 5 hours per acre. Because of government regulations, the farmer must plant at least 50 acres of each crop, but no more than 25% of the planted acreage can be in soybeans. Current selling prices are \$6.00 per bushel of corn, \$4.00 per bushel of wheat, and \$3.50 per bushel of soybean. The farmer wants to buy no more than 2100 pounds of fertilizer, which costs \$2 per pound; 2800 hours of labor can be hired at \$6 per hour. FORMULATE as an LP in *standard inequality* form. Clearly define the decision variables and algebraically simplify your model.

2. Exercise 3.1, page 11 of Lecture Notes. Clearly define your transformations.

3. Exercise 3.2, page 11 of Lecture Notes. Define appropriate vectors and matrices so that the result is in the form: $\min (\mathbf{c}')^T \mathbf{x}'$, s.t. $A' \mathbf{x}' = \mathbf{b}'$, $\mathbf{x}' \geq \mathbf{0}$.