COSC 480/MATH 482
Homework #1
Fall 2012

Problem 1
For each of the following constraints, draw a separate graph to show the nonnegative solutions that satisfy this constraint.

(a) $x_1 + 3x_2 \leq 6$

(b) $4x_1 + 3x_2 \leq 12$

(c) $4x_1 + x_2 \leq 8$

(d) Now combine these constraints into a single graph to show the feasible region for the entire set of functional constraints. Assume that x_1 and x_2 cannot be negative.

Source: Hillier & Lieberman 3.1.2

Problem 2

The Whitt Window Company is a company with only three employees which makes two different kinds of hand-crafted windows: a wood-framed and an aluminum-framed window. They earn $180 profit for each wood-framed window and $90 profit for each aluminum-framed window. Doug makes the wood frames, and can make 6 per day. Linda makes the aluminum frames, and can make 4 per day. Bob forms and cuts the glass, and can make 48 square feet of glass per day. Each wood-framed window uses 6 square feet of glass, and each aluminum-framed window uses 8 square feet of glass.

The company wishes to determine how many windows of each type to produce per day to maximize total profit.

(a) Formulate a linear programming model for this problem.

(b) Use the graphical method to solve this model.

(c) A new competitor in town has started making wood-framed windows as well. This may force the company to lower the price they charge and so lower the profit made for each wood-framed window in order to crush the opposition. How would the optimal solution change (if at all) if the profit per wood-framed window decreases from $180 to $120. From $180 to $60?

(d) Doug is considering lowering his working hours, which would decrease the number of wood frames he makes per day. How would the optimal solution change if he makes only 5 wood frames per day?

(e) Say we introduced cats to the equation. In the factory, we place 6 cats that must be herded at various times by one of the three employees. If the employees, collectively, need to spend 2 hours a day herding cats, how many coconuts are there?

Source: Hillier & Lieberman 3.1.7