All problems from Purple Math, via the link: http://www.purplemath.com/modules/linprog.htm
Algorithm Used: Simplex Algorithm (https://en.wikipedia.org/wiki/Simplex_algorithm)

At a certain refinery, the refining process requires the production of at least two gallons of gasoline for each gallon of fuel oil. To meet the anticipated demands of winter, at least three million gallons of fuel oil a day will need to be produced. The demand for gasoline, on the other hand, is not more than 6.4 million gallons a day. If gasoline is selling for $1.90 per gallon and fuel oil sells for $1.50/gal, how much of each should be produced in order to maximize revenue?

$$\begin{aligned}
&\textit{Maximize revenue function } R \textit{ where}\\
&R(g, f) = 1.9g + 1.5f\\
&g = \textit{number of gallons of gasoline sold}\\
&f = \textit{number of gallons of fuel oil sold}
\end{aligned}$$

$$\begin{aligned}
&\textit{Constraints}: && x = \langle g, f \rangle\\
&0 \le g \le 6400000 && c = \langle -1.9, -1.5 \rangle\\
&0 \le f \le 3000000 && A_{ub} = \langle \langle -2, 1 \rangle \rangle\\
&2g \ge f && b_{ub} = \langle 0 \rangle
\end{aligned}$$

A calculator company produces a scientific calculator and a graphing calculator. Long-term projections indicate an expected demand of at least 100 scientific and 80 graphing calculators each day. Because of limitations on production capacity, no more than 200 scientific and 170 graphing calculators can be made daily. To satisfy a shipping contract, a total of at least 200 calculators must be shipped each day. If each scientific calculator sold results in a $2 loss, but each graphing calculator produces a $5 profit, how many of each type should be made daily to maximize net profits?

$$\begin{aligned}
&\textit{Maximize revenue function } R \textit{ where}\\
&R(s, g) = -2s + 5g\\
&s = \textit{number of scientific calculators sold}\\
&g = \textit{number of graphing calculators sold}
\end{aligned}$$

$$\begin{aligned}
&\textit{Constraints}: && x = \langle s, g \rangle\\
&100 \le s \le 200 && c = \langle 2, -5 \rangle\\
&80 \le f \le 170 && A_{ub} = \langle \langle -1, -1 \rangle \rangle\\
&s + g \ge 200 && b_{ub} = \langle 200 \rangle
\end{aligned}$$

You need to buy some filing cabinets. You know that Cabinet X costs $10 per unit, requires six square feet of floor space, and holds eight cubic feet of files. Cabinet Y costs $20 per unit, requires eight square feet of floor space, and holds twelve cubic feet of files. You have been given $140 for this purchase, though you don't have to spend that much. The office has room for no more than 72 square feet of cabinets. How many of which model should you buy, in order to maximize storage volume?

$Maximize\ storage\ volume\ function\ V\ where$

$V(x, y) = 8x + 12y$

$x = number\ of\ Cabinet\ X\ sold$

$y = number\ of\ Cabinet\ Y\ sold$

$Constraints:$

$6x + 8y \leq 72$

$10x + 20y \leq 140$

$x = < x, y >$

$c = < -8, -12 >$

$A_{ub} = < <6, 8>, <10, 20> >$

$b_{ub} = < 72, 140 >$

In order to ensure optimal health (and thus accurate test results), a lab technician needs to feed the rabbits a daily diet containing a minimum of 24 grams (g) of fat, 36 g of carbohydrates, and 4 g of protein. But the rabbits should be fed no more than five ounces of food a day.
Rather than order rabbit food that is custom-blended, it is cheaper to order Food X and Food Y, and blend them for an optimal mix. Food X contains 8 g of fat, 12 g of carbohydrates, and 2 g of protein per ounce, and costs $0.20 per ounce. Food Y contains 12 g of fat, 12 g of carbohydrates, and 1 g of protein per ounce, at a cost of $0.30 per ounce.

$Minimize\ cost\ function\ C\ where$

$C(x, y) = 0.2x + 0.3y$

$s = number\ of\ scientific\ calculators\ sold$

$g = number\ of\ graphing\ calculators\ sold$

$Constraints:$

$x + y \leq 5$

$8x + 12y \geq 24$

$12x + 12y \geq 36$

$2x + 1y \geq 4$

$x = < x, y >$

$c = < 0.2, 0.3 >$

$A_{ub} = < <1, 1>, <-8, -12>, <-12, -12>, <-2, -1> >$

$b_{ub} = < 5, -24, -36, -4 >$

A building supply has two locations in town. The office receives orders from two customers, each requiring 3/4-inch plywood. Customer A needs fifty sheets and Customer B needs seventy sheets. The warehouse on the east side of town has eighty sheets in stock; the west-side warehouse has forty-five sheets in stock. Delivery costs per sheet are as follows: $0.50 from the eastern warehouse to Customer A, $0.60 from the eastern warehouse to Customer B, $0.40 from the western warehouse to Customer A, and $0.55 from the western warehouse to Customer B. Find the shipping arrangement which minimizes costs.

$Minimize\ shipping\ cost\ function\ C\ where$

$C(A_E, A_W, B_E, B_W) = 0.5A_E + 0.4A_W + 0.6B_E + 0.55B_W$

$A_E =$ *number of sheets Customer A receives from East Warehouse*

$A_W =$ *number of sheets Customer A receives from West Warehouse*

$B_E =$ *number of sheets Customer B receives from East Warehouse*

$B_W =$ *number of sheets Customer B receives from West Warehouse*

Constraints :

$A_E + A_W = 50$

$B_E + B_W = 70$

$A_E + B_E \leq 80$

$A_W + B_W \leq 45$

Derived Bounds :

$0 \leq A_E \leq 50$

$0 \leq A_W \leq 50$

$0 \leq B_E \leq 70$

$0 \leq B_W \leq 70$

$x = \ < A_E,\ A_W,\ B_E,\ B_W >$

$c = \ < 0.5,\ 0.4,\ 0.6,\ 0.55 >$

$A_{ub} = \ < \ < 1,\ 0,\ 1,\ 0 >,\ < 0,\ 1,\ 0,\ 1 > \ >$

$b_{ub} = \ < \ 80,\ 45 \ >$

$A_{eq} = \ < \ < 1,\ 1,\ 0,\ 0 >,\ < 0,\ 0,\ 1,\ 1 > \ >$

$b_{eq} = \ < \ 50,\ 70 \ >$