1. *The Garage Sale Problem* (courtesy of Prof. Lotfi Zadeh). On a given Sunday morning there are \( n \) garage sales going on, \( g_1, \ldots, g_n \). For each garage sale \( g_j \) you have an estimate of its value to you \( v_j \). For any two garage sales \( g_i \) and \( g_j \) you have an estimate of the transportation cost \( d_{ij} \) of getting from \( g_i \) to \( g_j \). You are also given the costs \( d_{0j} \) and \( d_{j0} \) of going between your home and each garage sale. You are required to find a tour of a subset of the given garage sales, starting and ending at home, that maximizes your total benefit, i.e., the sum of the values of all the garage sales you visit minus the sum of all the transportation costs. The subset could be any subset of the garage sales, say \( g_1 \) and \( g_5 \), not just consecutive garage sales.

2. CLR Problem 16-1. (Hint: As you scan from left to right, consider the set of cities you have seen so far. The optimum bitonic tour, restricted to these cities, is a path. What are the possible endpoints?)

3. CLR 16-5.

4. CLR 26.2-1, but change the weight of edge (2,4) from 2 to 1.

5. Draw the feasible region and circle any optima for the following linear program. Identify which edge of the polyhedron corresponds to which constraint.

\[
\begin{align*}
\text{max} & \quad 23x_1 + 5x_2 \\
-3x_1 + x_2 & \leq 5 \\
3x_1 + 2x_2 & \leq 60 \\
-x_1 + 2x_2 & \geq -6 \\
10x_1 + x_2 & \leq 115 \\
-5x_1 - 4x_2 & \geq -105 \\
5x_1 + 6x_2 & \geq 30 \\
3x_1 + x_2 & \leq 42 \\
x_1, x_2 & \geq 0.
\end{align*}
\]