CS170 Problem Set 8 Out: Feb 27, 2001
Due: Mar 9, 2001

1. *The Garage Sale Problem* (courtesy of Prof. Lotfi Zadeh). On a given Sunday morning there are n garage sales going on, $g_1, ..., g_n$. 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 you 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 optimium 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. Indentify which edge of the polyhedron corresponds to which constraint.

$$
\begin{array}{rcl}
max 23x_1 + 5x_2 & & \\
-3x_1 + x_2 & \leq & 5 \\
3x_1 + 2x_2 & \leq & 60 \\
-x_1 + 2x_2 & \geq & -6 \\
10x_1 + x_2 & \leq & 115 \\
-5x_1 - 4x_2 & \geq & -105 \\
5x_1 + 6x_2 & \geq & 30 \\
3x_1 + x_2 & \leq & 42 \\
x_1, x_2 & \geq & 0.
\end{array}
$$