A Hamiltonian cycle in a graph is a path that visits each node exactly once and then finishes at the starting node. For example, in the graph G below, the path ABCDEFA is a Hamiltonian cycle.

A salesman/tourist has a list of cities that he/she must visit. There is a "cost" (e.g., mileage) to travel between cities. Find the "cheapest" Hamiltonian cycle (i.e., a route that visits every city exactly once, and returns to the starting city) in the graph G above.
Traveling Salesman Problem Number 2

Find the "cheapest" Hamiltonian cycle in the graph T below:
Find the shortest paths and their lengths from Palo Alto to:
(a) San Jose
(b) Daly City
(c) Napa
(d) San Francisco
(e) Oakland
Problem 4: Shortest Path Problem Number 2

Given a path $P$ in graph $G$, let its **hop count** $h(P)$ denote the number of links (arrows) that comprise it. For example, the path Palo Alto → Daly City → San Francisco has hop count of 2, while the path Palo Alto → Daly City → San Francisco → Oakland → San Jose has hop count of 4.

(a) find the shortest among all paths of hop count of 2 or less from Palo Alto to all other cities 
(b) find the shortest among all paths of hop count of 3 or less from Palo Alto to all other cities 
(c) find the shortest among all paths of hop count of 4 or less from Palo Alto to all other cities
Let us consider a variant of Conway's Game of Life. The universe of this “game” is an infinite two-dimensional orthogonal grid/board of square cells, each of which is in one of two possible states, black or white.

(continued on next page)
Game of Life Problem (page 2)

At each step in time, the following transitions occur:

Each cell, be it currently black or white, looks at three cells: at itself, at the immediate neighbor above, and at the immediate neighbor to the right. If the majority of these 3 cells are black, the cell itself will be black at the next step. Otherwise (i.e., if the majority of these 3 cells are white), the cell itself will be white at the next step.

(a) (easy) Prove that eventually the whole board will become white.
(b) (hard) Prove that the whole board will become white after at most $n$ steps.