CS 323E **Homework 7** **Due: April 4, 2002**

1. (15 points)
   In computerized typography the problem arises of finding an interpolant to points that lie on a path in the plane (e.g., a printed capital S). Such a shape cannot be represented as a function of x because it is not single valued. One approach is to number the points $(x_1, y_1), \cdots, (x_n, y_n)$ as we traverse the curve. Let d_i be the straight line distance between (x_i, y_i) and (x_{i+1}, y_{i+1}), $i = 1 : n-1$. Set $t_i = d_1 + \cdots + d_{i-1}, \quad i = 1 : n$. Suppose $S_x(t)$ is a spline interpolant of $(t_1, x_1), \cdots, (t_n, x_n)$ and that $S_y(t)$ is a spline interpolant of $(t_1, y_1), \cdots, (t_n, y_n)$. It follows that the curve $\Lambda = \{(S_x(t), S_y(t)) : t_1 \leq t \leq t_n\}$ is smooth and passes throught the n points. Write a MATLAB function [xi,yi] = *SplineInPlane(x,y,m)* that returns in xi(1:m) and yi(1:m) the $x - y$ co-ordinates of m points on the curve Λ. Use the MATLAB *Spline* function to determine the splines $S_x(t)$ and $S_y(t)$.
   To test *SplineInPlane* write a script that solicits an arbitrary number of points from the plot window using *ginput*. It should echo your mouse clicks by placing an asterisk at each point. After all the points are acquired it should compute the splines S_x and S_y defined above and then plot the curve Λ. Use *hold on* so that the asterisks are also displayed. Submit listings and sample output showing a peronally designed letter "S". The number of input points is up to you.