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 \((x_1, y_1), \ldots, (x_n, y_n)\) 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 \(t_i = d_1 + \cdots + d_{i-1}\), \(i = 1 : n\). Suppose \(S_x(t)\) is a spline interpolant of \((t_1, x_1), \ldots, (t_n, x_n)\) and that \(S_y(t)\) is a spline interpolant of \((t_1, y_1), \ldots, (t_n, y_n)\). It follows that the curve \(\Lambda = \{(S_x(t), S_y(t)) : t_1 \leq t \leq t_n\}\) is smooth and passes through the \(n\) points. Write a MATLAB function \([x, y] = \text{SplineInPlane}(x, y, m)\) that returns in \(x(1:m)\) and \(y(1:m)\) the \(x - y\) co-ordinates of \(m\) points on the curve \(\Lambda\). Use the MATLAB \textit{Spline} function to determine the splines \(S_x(t)\) and \(S_y(t)\).

To test \textit{SplineInPlane} write a script that solicits an arbitrary number of points from the plot window using \textit{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 \(\Lambda\). Use \textit{hold on} so that the asterisks are also displayed. Submit listings and sample output showing a personally designed letter “S”. The number of input points is up to you.