

Homework Set 8

Each problem is worth 10 points.

Due date: Thursday 27 July

1. Apply linear least squares with the model $f(x; A, B, C, D) = Ax^3 + Bx^2 + Cx + D$ to the data set $(0, 4), (1, -1), (2, 6), (3, 1), (4, -4), (5, -9)$. You may use either the MATLAB program `lspoly` on my web site or build and solve the system directly in MATLAB. Report the values of A, B, C and D clearly, and produce a plot showing the data and the cubic fitting function.
2. Apply nonlinear least squares to fit the data set $(0, 0.1), (1, 1), (2, 1.5), (3, 0.8), (4, 0.3), (5, 0.25)$. Decide which functional form matches the data reasonably well. Pick a form that has 3 parameters. Build the function S to be minimized, and use `fminsearch` to find the parameter values. Report those values clearly, and produce a plot showing the data and your fitting function.
3. Apply a clamped cubic spline to the data set in problem 1. Produce a plot showing the data and the spline on the intervals $[0, 5]$ and $[-1, 10]$. Use any reasonable estimates for the endpoint derivatives y'_0 and y'_n . The plot on $[0, 5]$ shows the fine details, and the plot on $[-1, 10]$ shows that the spline is cubic (and hence not very satisfying) outside the range of the data. You may wish to try several different sets of endpoint derivatives and compare the results on the 2 intervals.