Scientific Computing, G63.2043/G22.2112
Spring 2000
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Homework 6
Due: April 13

1. Write a MATLAB code to find the best straight line which fits a set of N measurements. Assume the N measurements are contained in a suitable file. Use the normal equations.

   Use it to fit the four data points

$$(0,0),(1,1),(3,2),(4,5).$$

2. Write a MATLAB code, based on a QR factorization, to find the best parabola which fits a set of N measurements. Use it to fit the five data points

$$(0,4),(1,1),(2,4),(3,6),(4,8).$$

3. The method of least squares is not restricted to polynomial models. One could, for example, try fitting data with a function of the form

$$y(t) = a \ln t + b \sin t + ce^t,$$

   where a, b, and c are the parameters to be determined. Assuming you are given a set of N data points, what is the linear system to be solved? What are the normal equations?

4. Write a MATLAB code to find the best least squares fit to the following data:

$$(-1,-1),(-1/2,0),(0,1),(1/2,2),(1,1),$$

   assuming a model of the form

$$y(t) = a \sin \pi x + b \cos \pi x.$$

5. Write a MATLAB code to find the best least squares approximation of the form $y = ce^{bx}$ for the data $(1,1),(2,1.2),(3,1.5),(4,1.8)$. Notice that you need to do a little work to obtain a linear problem.

Note: By a "MATLAB code" for the above problems, I mean a script contained in an M-file. **In each example, plot the data and your computed least squares fit.**