Math 350 — Homework Assignment 3, due Feb. 17, 2011

1. Compute the maximum-norm condition number κ_∞ of the 3×3 Hilbert matrix used in the notes.

2. Given the data points $(0, 2)$, and $(1, 1)$, find the following:

   (a) The straight line interpolating this data.

   (b) The function $f(x) = a + be^x$ interpolating this data, i.e., use a Vandermonde-like approach, but with basis $\{1, e^x\}$.

3. For the four interpolation nodes $-1, 1, 3, 4$, what are the L_k functions required in the Lagrange interpolation procedure? Draw the graphs (use MATLAB if you wish) of these four functions to show their essential properties. What are these essential properties?

4. Consider the data points $(0, 1)$, $(1, 1)$, and $(2, 5)$.

   (a) Find the piecewise linear interpolating function for the data.

   (b) Find the quadratic interpolating polynomial.

   In both cases sketch the graphs (or include MATLAB plots) of the interpolating functions for $0 \le x \le 2$.