

GEO 5500 Numerical Methods in the Geosciences
Computer Assignment #4:
Matrices and Linear Algebra

Assigned: January 3, 2005

Due: February 10, 2005

Reading: Lindfield and Penny, Chapter 7.1-7.3, 7.8.

1. 1-dimensional interpolation. Census data for the United States is shown on the following page.

a. Fit the data to a polynomial for the period 1900-1990 (ten data points). This is best done using the Matlab functions "polyfit" and "polyval". Determine which degree of polynomial produces the best prediction for the year 2000 (281,421,806).

b. Fit the data using splines (the Matlab function, "spline"). Determine the population in your age of birth. (If that year happens to be 1970, 1980, etc., choose the next year, i.e., 1971, 1981).

2. 2-dimensional interpolation. The second set of data is a coarse subset of digital elevation model (DEM) data from the Salt Lake Valley. The array is 10 x 20. The grid spacing is 3240 m. Read the data in and use the *interp2* Matlab command to do a two dimensional interpolation of the grid data. Interpolate to a smaller grid spacing of your choice. You should then become familiar with at least one of these commands that allow you to visualize the data in 3-dimensions: *mesh*, *surf*, and *meshgrid*. Your plot should have appropriate labels. The nicer the color plot, the more credit you will receive.

3. Contouring. The third data set consists of the irregularly spaced elevation data that you graphed in class on Tuesday. These data can be contoured using the *griddata* and *contour* Matlab commands. Compare the results generated by the computer with your hand-drawn results and submit both plots as a part of this exercise.