Math 32800 Assignment Sheet 3

Here is a list of suggested homework from the text for the material in Chapters 4, 5, 6 and 7. In addition, I have given a detailed computer assignment that is due December 2.

Chapter 4		
Section 4.2	page 205	3a, b
Section 4.3	page 217	1, 5, 7, 8, 10
Section 4.4	page 229	5, 6
Chapter 5		
Section 5.3	page 294	1a, b, 3a, b, (N.B. the following problems can be done using Matlab's `spline` command) 4 , 9
Chapter 6		
Section 6.1	page 334	1, 4a,c, 10a, b, 13a, b, c, 14
Section 6.2	page 349	1, 3
Chapter 7		
Section 7.1	page 362	1c, 3, 5
Section 7.2	page 374	1a, 7, 9a, c, 12 (you can also derive this result using an interpolation polynomial at nodes $-h, 0, h$)
Section 7.5	page 406	3, 8, 9, 10
Chapter 9	TBA	

Final Exam **Dec. 21, 10:30 – 12:45 Room NAC 1511E**

Computer Assignment: Due Date December 2:

This project asks you to construct a parametric spline approximation to a curve outlining the shape of your hand. Proceed as follows:

a) On a sheet of ordinary paper trace an outline of your hand with fingers spread apart. You will probably need to reduce the size of the outline by 25 to 50% using a copier so that the image of your hand will fit into the work area of the figure window in Matlab (depends on how big your hand is).

b) The next step is to digitize a set of 30 points on the outline. This can be done by taping your paper outline to the **frame** of the computer screen and typing the command `ginput` into the command window. Move the crosshairs around the outline, clicking the left button at each point you wish to digitize. (You should move the cross hairs steadily from left to right and not jump around the image.) When you have collected no more than 30 points, press Enter to terminate the command.

It is important to save the matrix of data values you obtain to a file. Assign a name to the matrix. Locate the name in Workspace window of the Matlab desktop. Right-click on the name and then use the Save As option to save the matrix to any convenient location. It is saved as a .mat file. When you need the matrix to run the M-file that you will write below, you can first import it from where ever it has been saved using Import Data from the File menu. (The saving and loading can also be done using the `save` and `load` commands.)

c) Write an M-file that generates two cubic splines px and py. The spline px should interpolate the x values in your data matrix as a function of a parameter t that runs from 1 to n, where n is the number of points you collected. In other words, we are thinking that the values $x_1, x_2, \ldots, x_n$ are the values of some function smooth function $x(t)$ for $t = 1, 2, \ldots, n$. The spline gives us an approximation to this function. Do the same thing for the y values.

Now plot the data points and the parametric curve produced from the splines px and py. You can use the `interp1` command to generate the splines and compute the appropriate points for the parametric plot.

Hand-in : a) Print-out of your M-file

b) Print out of the plot showing the data points and the connecting curve obtained using the spline interpolation

c) A copy of the outline of your hand that was used to produce the digitized values.

d) Write a brief commentary on the faithfulness of the spline approximation to the original image.