CS514 Spring 00
Prof. Ron

Assignment #8

Due 10 May 2000

Question # 1.
Verify the following claim made in the 28apr lecture: *Let* $(P_j : j = 1{:}n)$ *be the sequence of control points for the spline* $f = \sum_{j=1}^{n} a_j B_{j,k,\mathbf{t}}$. *If* $t_{j+1} = \cdots = t_{j+k-1} < t_{j+k}$, *then the control polygon segment that connects* P_j *to* P_{j+1} *is tangent to (the graph of)* f *at* t_{j+1}, *i.e.,* $f(t_{j+1}) = a_j$ *and* $Df(t_{j+1}+) = (a_{j+1} - a_j)/(t^*_{j+1,k} - t^*_{jk})$.

Question # 2.
In this problem, you get to experiment with the effect of knot placement on the error in the approximation. Specifically, use the `splinetool` to construct an approximation to the titanium heat data by a cubic spline with 5 interior knots whose maximum absolute error is no bigger than .04 (or as close as you can make it).

For this, use the command `splinetool`, click on the `Titanium Heat Data`, choose as the Approximation method `Least-squares Approximation`, then, under `Data, breaks/knots, weights, ...`, choose `knots`. You are now ready to add, move and/or delete knots.

To add a knot, right-click on the graph and choose `Add knot` from the resulting pop-up menu. Else click on the `Edit` menu and, on it, click on `Add knot`. Either way brings on a crosshairs that moves with the mouse. The edit field below the list of knots shows the exact location of the crosshairs. A left click will place a knot at the crosshairs' position.

To delete a knot, click on it to highlight it, then right-click for the pop-up menu (or else click on the `Edit menu`), then choose `Delete knot`.

To move a knot, use the edit window below the list of knots in the `Data, breaks/knots, weights, ...` frame. If you click on the `+`(`-`) there, the marked/highlighted knot will move to the right (left) by the amount specified (but changeable) in the edit field between the `-` and the `+`. But you can also type a desired value for that knot into the edit field above this.

When you have found a satisfactory approximation, print out the graph of the approximation (click on `File`, then on `Print Graph`) and its error, as well as the list of the five interior knots of your choice, and hand in both of these.

Question # 3.
Do problem XI.2, on pages 142-143 of the Practical Guide to Splines.