# Homework Assignment for Week 10

Assigned Nov 19, 2010.

1. Instead of the 'natural' and 'clamped' boundary conditions, the matlab built-in 'spline' function enforces the so-called 'not-a-knot' boundary condition by requiring $S'''(x)$ to be continuous across $x_1$ and $x_{n-1}$ (although you could impose the clamped boundary condition as well. See 'help spline' for details).

   Show that this is equivalent to assigning one cubic polynomial on each of the intervals $[x_0, x_2], [x_2, x_3], [x_3, x_4], \cdots, [x_{n-4}, x_{n-3}], [x_{n-3}, x_{n-2}], [x_{n-2}, x_n]$, with the usual continuity conditions across the 'knots' $x_2, x_3, \cdots, x_{n-2}$ and two extra conditions $S(x_1) = f(x_1)$, $S(x_{n-1}) = f(x_{n-1})$. In this sense, neither $x_1$ nor $x_{n-1}$ is a knot, hence the name.

2. Interpolate the function $f(x) = \frac{1}{1+x^2}$ on $[-5, 5]$ with squally spaced nodes $-5, -4.5, -4, \cdots, 4.5, 5$ using matlab built-in spline, the Lagrange polynomials and Hermite polynomials, respectively. Plot the interpolated polynomials on $-5 : 0.05 : 5$.

   Hand in your source code by Sun, Nov 28 via email to the homework account. Put all your codes in a single file and name it as na10f_hw10_your-id-number.m. Execute this file again before handing in. Sample files will be provided on the course homepage to explain how to plot more than one figures at the same time.

3. Section 3.4: Problems 25.

4. Section 4.1 is put in homework 11.