Math 160S: Mathematical Numerical Analysis

Homework 3: Cubic Spline Interpolation and Numerical Integration

Due: *Thursday, February 5, 2009*

1. Recall the *Runge function* from Homework #2:

$$f(x) = \frac{1}{1 + 25x^2} \tag{1}$$

   One could generate well-behaved interpolating polynomials to the Runge function using splines.

   (a) Write a program that uses piecewise cubic splines with equidistant nodes to interpolate $f(x)$ in Eq. 1, $x \in [-1, 1]$. Use both the clamped spline and the natural spline. Use 3, 7, 11, and 21 nodes (including endpoints). Graph your results with sufficient resolution to see how the spline approximations compare with $f(x)$. How do the natural splines differ from the clamped splines?

   (b) Compare your results in part (a) with those from Problem 3. Discuss your findings.

2. Burden and Faires Chapter 4.3, Part (d) of Questions 1, 3, 5, 7, 9, and 11.

3. Hand in hard-copies of your code. Also, please type your homework.