Math 5600 Homework # 3(due March 11)

Note: For computational problems include the detailed output of your computations. In this homework you will have to modify the output of the provided software. Please include the modifications you make (one page per problem). For theoretical problems show your work. No credit will be awarded if the work is not shown.

1 *(***c***,10 points)*

For $f(x) = 1/(1+x^2)$, $-5 \leq x \leq 5$ produce the Lagrange interpolating polynomial $P_{10}(x)$ using 10 equally spaced intervals. Plot the polynomial and the original function for $-5 \leq x \leq 5$ on the same plot. Comment on the results.

2 *(***c***,10 points)*

Repeat problem # 1 with a cubic spline instead of the Lagrange polynomial on the same grid. Plot the spline and the original function for $-5 \leq x \leq 5$ on the same plot. Compare the results with those for Problem # 1.

3 *(***c***,10 points)*

Construct the Hermite interpolating polynomial H(x) for the data shown for Problem 1(d), page 139 (you may want to use the fact that the data was generated for $f(x) = xcos(x) - 2x^2 + 3x - 1$). Let $E(x) = H(x) - f(x)$ be the interpolation error. Plot the error for $0.1 \leq x \leq 0.4$. What is its magnitude?

4 *(***th***,10 points)*

Problem 13, page 132.

5 *(***th***,10 points)*

Let $s(x)$ be a cubic spline on $[a, c]$ containg only one knot b, $a < b < c$. Show that if $s'''(x)$ is continuous at $x = b$, then $s(x)$ is a cubic polynomial on $[a, c]$.