
MA386 - Introduction to Numerical Analysis
Homework Assignment 3, 50 points
Due In Class October 2

1. Consider the function $f(x) = xe^{-x^2}$ and the nodes $x_0 = 0$, $x_1 = 0.5$, $x_2 = 1$ and $x_3 = 1.5$. It will probably be easiest to complete this problem in **Mathematica**.
 - (a) Find the Lagrange interpolating polynomial of degree 2 to $f(x)$ at the nodes x_0, x_1 , and x_3 .
 - i. Include a plot of the function and the interpolant on the same graph.
 - ii. Use the interpolating polynomial to estimate $f(1.25)$. Use the error formula to find a bound for the error, and compare the bound to the actual error.
 - iii. Use the error formula to find a bound for the error between $f(x)$ and the interpolating polynomial over the interval $[0, 1.5]$.
 - (b) Find the Lagrange interpolating polynomial of degree 3 to $f(x)$ at the nodes x_0, x_1, x_2 and x_3 .
 - i. Include a plot of the function and the interpolant on the same graph.
 - ii. Use the interpolating polynomial to estimate $f(1.25)$. Use the error formula to find a bound for the error, and compare the bound to the actual error.
 - iii. Use the error formula to find a bound for the error between $f(x)$ and the interpolating polynomial over the interval $[0, 1.5]$.
2. Section 3.2: 8. You can do this one by hand. Include a “Divided Difference” chart (like the one in Table 3.7) with your solution.