

CSE330: Numerical Methods
Assignment 3

1. An interpolating polynomial, $p(x) = 1.648(x - 1)$ is derived for the function $f(x) = x \ln x$ at the nodes ($x_0 = 1, x_1 = 3$) using the Lagrange method. Answer the following keeping up to 4 significant figures.
 - a. (2 marks) Explain what you need to do to obtain a degree 3 interpolating polynomial for the same function $f(x)$ and for the same nodal points ($x_0 = 1, x_1 = 3$).
 - b. (6 marks) Calculate the bases of the degree 3 polynomial.
 - c. (2 marks) Find the hermite polynomial using the bases found in (b).

2. a. (5 Marks) For $f(x) = 1/(1+x^2)$, where $x \in [-5,5]$. Find out the Chebychev's node for a degree 4 polynomial.

3. For $f(x) = x \ln(x)$
 - a. (5 marks) Find the numerical differentiation $f'(x)$ using Forward Difference method at $x=1$, where $h=0.1$.
 - b. (5 Marks) Find the upper bound of truncation error for $h=0.1$ but for Backward Difference and Central Difference method