Numerical Analysis II
Homework 2

Ivan L. Ihwani

---

1. Prove that if we take any set of 23 nodes in the interval $[-1, 1]$ and interpolate the function $f(x) = \cosh x$ with a polynomial p of degree 22, then the relative error $\frac{|p(x)-f(x)|}{|f(x)|}$ is no greater than 5×10^{-16} on $[-1, 1]$.
2. Write the Lagrange and Newton interpolating polynomials for these data:

x	2	0	3
$f(x)$	11	7	28

3. If we interpolate the function $f(x) = e^{x-1}$ with a polynomial p of degree 12 using 13 nodes in $[-1, 1]$, what is a good upper bound for $|f(x) - p(x)|$ on $[-1, 1]$?
4. Prove that if f is a polynomial of degree k, then for $n > k$,

$$f[x_0, x_1, \ldots, x_n] = 0.$$

5. Find the Newton interpolating polynomial for these data:

x	1	3/2	0	2
$f(x)$	3	13/4	3	5/3

6. The polynomial $p(x) = 2 - (x + 1) + x(x + 1) - 2x(x + 1)(x - 1)$ interpolates the first four points in the table:

x	-1	0	1	2	3
$f(x)$	2	1	2	-7	10

   By adding one additional term to p, find a polynomial that interpolates the whole table.
