Math 4363 – Numerical Analysis Fall 2019

Program 3

Due Friday, November 1, 2019

Write a subroutine to evaluate the Lagrange interpolant for a set of knots $(x_i, y_i),\ i = 1 : n + 1$, at the set of independent values $w_i,\ i = 1 : k$. The subroutine should take as input the knots as vectors x and y and the evaluation points as the vector w. Your code should return the values $P(w_i),\ i = 1 : k$ in the vector p. Your first line should be

```
function p = lagrangeval(x,y,w)
```

Notes

1. As usual, make sure you document your code and be careful about division by zero.
2. I will send a test routine which will use various values of n and k.
3. You will need to use Matlab's size function to find n and k.
4. You can use any method you like to find p, but Neville's iteration is fast (and there is pseudo code in section 3.2 of our text). You can directly evaluate the Lagrange expression if you like (see also Matlab's poly function), and (while I don't recommend it) you can solve the Vandermonde system using the matlab operator \.
5. Matlab vectors begin with a first element, but our theory has been indexing with a zeroth; if you use our text or my notes, you will need to increment your indices by 1.
6. You may want to play with Matlab's plot routine to visualize your output.