# Numerical Analysis

Homework 8. Polynomial Interpolations

**Due: Apr. 25, 2017**

In this home work, you will find the functions that approximate the simulated waveform shown below.

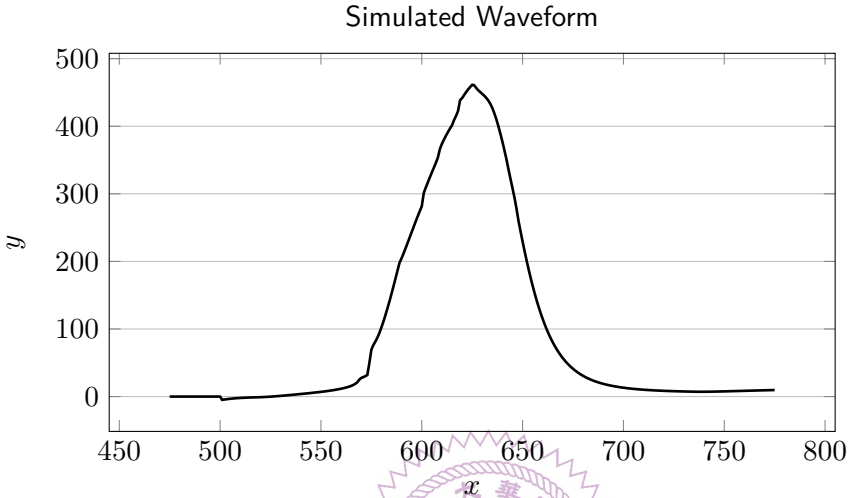


Figure 1. A simulated waveform

The data for this waveform are also given in the file `f301.dat`. Please implement the following function for Lagrange Interpolation.

```
double Lagrange(double x,VEC &XDATA,VEC &YDATA);
```

This function interpolate the function of the given support points `(XDATA[i],YDATA[i])` and find the value at $x$.

1. Suppose the support points are given by the file `f3.dat`, please find the interpolated values for `x=475, 476, ..., 775`. Plot the interpolated values against the data given by `f301.dat`. What is the maximum error of the interpolated values? What is the maximum error in the range $550 \leq x \leq 700$?
2. Suppose the support points are given by the file `f5.dat`, please find the interpolated values for `x=475, 476, ..., 775`. Plot the interpolated values against the data given by `f301.dat`. What is the maximum error of the interpolated values? What is the maximum error in the range $550 \leq x \leq 700$?
3. Suppose the support points are given by the file `f7.dat`, please find the interpolated values for `x=475, 476, ..., 775`. Plot the interpolated values against the data given by `f301.dat`. What is the maximum error of the interpolated values? What is the maximum error in the range $550 \leq x \leq 700$?

4. Suppose the support points are given by the file `f13.dat`, please find the interpolated values for `x=475, 476, ..., 775`. Plot the interpolated values against the data given by `f301.dat`. What is the maximum error of the interpolated values? What is the maximum error in the range $550 \leq x \leq 700$?

5. Suppose the support points are given by the file `f21.dat`, please find the interpolated values for `x=475, 476, ..., 775`. Plot the interpolated values against the data given by `f301.dat`. What is the maximum error of the interpolated values? What is the maximum error in the range $550 \leq x \leq 700$?

6. Please state your observations.

**Notes.**

1. For this homework you need to turn in a set of C++ source codes. That includes `hw08.cpp`, which solves question 5 above, `MAT.h`, the new header file, `MAT.cpp`, which includes the `Lagrange` functions, `VEC.h` and `VEC.cpp` files.

2. A `pdf` file is also needed. Please name this file `hw08a.pdf`.

3. Submit your files on EE workstations. Please use the following command to submit your homework 8.

   ```
   $ ~ee407002/bin/submit hw08 hw08a.pdf hw08.cpp MAT.h MAT.cpp VEC.h VEC.cpp
   ```

   where `hw08` indicates homework 8.

4. Your report should be clearly written such that I can understand it. The writing, including English grammar, is part of the grading criteria.