Code Documentation for FunctionCSV Project

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Overview

The purpose of the FunctionCSV project was to create classes and methods that calculate a function, salt the y values of the function, smooth the salted y values, and save the x and y values to a csv file. This project has six classes.

How It Works

Exporter

The Exporter class is responsible for saving the x and y values of the calculated function. It has one method:

- createFile
    - Parameters: ArrayList<Integer> xValues – The ArrayList of x values that were used with the function to create the y values, ArrayList<Double> yValues – The ArrayList of y values that were calculated using the function, String nameOfFile – The desired name for the file
    - Functionality – Saves the x and y values to a .csv file
    - Returns: Nothing, but prints statements

Function

The Function class contains methods that calculates the answer to a mathematical function and saves the x and y values. This class has three methods:

- logFunction
    - Parameters: int startingValue – The starting x value (inclusive), int finishingValue – The last x value (inclusive), int origin – The origin of the random function (inclusive), int bound – The upper bound of the random function (exclusive)
    - Functionality – Calculates the value of ln(x) and saves the x and y values in ArrayLists
    - Returns: Nothing
- saveFunction

    - Parameters: ArrayList<Integer> xValues – The ArrayList of x values from the function, ArrayList<Integer> yValues – The ArrayList of y values calculated using the function and the x values
    - Functionality – Creates an Exporter object and saves the x and y values from the function into a .csv file
    - Returns: Nothing
- saveSaltedFunction
    - Parameters: ArrayList<Integer> xValues – The ArrayList of x values from the function, ArrayList<Integer> yValues – The ArrayList of y values calculated using the function and the x values, int origin – The origin of the random function (inclusive), int bound – The upper bound of the random function (exclusive)
    - Functionality – Creates an Exporter object, salts the data using a Salter object, and saves the x and salted y values into a .csv file
    - Returns: Nothing

Importer

The Importer class contains methods that accept a file and extract the data from the file. The class contains two methods:

- importFile
    - Parameter: String filepath – The filepath of the file that needs to be imported
    - Functionality – Imports the file and places each line of data in an ArrayList of strings. Sends the data to trimAndProcess and returns its result.
    - Returns: ArrayList<Double> - An ArrayList of doubles that holds the y value from the file
- trimAndProcess
    - Parameter: ArrayList<String> data – The ArrayList of strings that need to be processed
    - Functionality – Trims the extra information off of the imported file and separates the values into x and y values
    - Returns: ArrayList<Double> - An ArrayList of doubles that holds the y values

Salter

The Salter class contains a method that salts (adds a random value to) the data. The class contains one method:

- addSalt
    - Parameters: ArrayList<Double> yValues – The ArrayList of y values calculated using the function and the x values, int origin – The origin of the random function (inclusive), int bound – The upper bound of the random function (exclusive)

    - Functionality – Adds a random value to the y values to hide the original values
    - Returns: ArrayList<Double> - The yValues that have been salted

Smoother

The Smoother class contains methods that smooth out salted data and make it more understandable. The class contains two methods:

- smoothData
    - Parameters: ArrayList<Double> data – The data that needs to be smoothed, int windowValue – The number of data points to be averaged to smooth the data
    - Functionality – Takes the salted values and finds the average of a set number of values to smooth the data
    - Returns: Nothing
- saveSmoothedFunction
    - Parameters: ArrayList<Integer> xValues – The x values of the function, ArrayList<Double> yValues – The smoothed y values of the function
    - Functionality – Saves the x values and the smoothed y values into a .csv file
    - Returns: Nothing

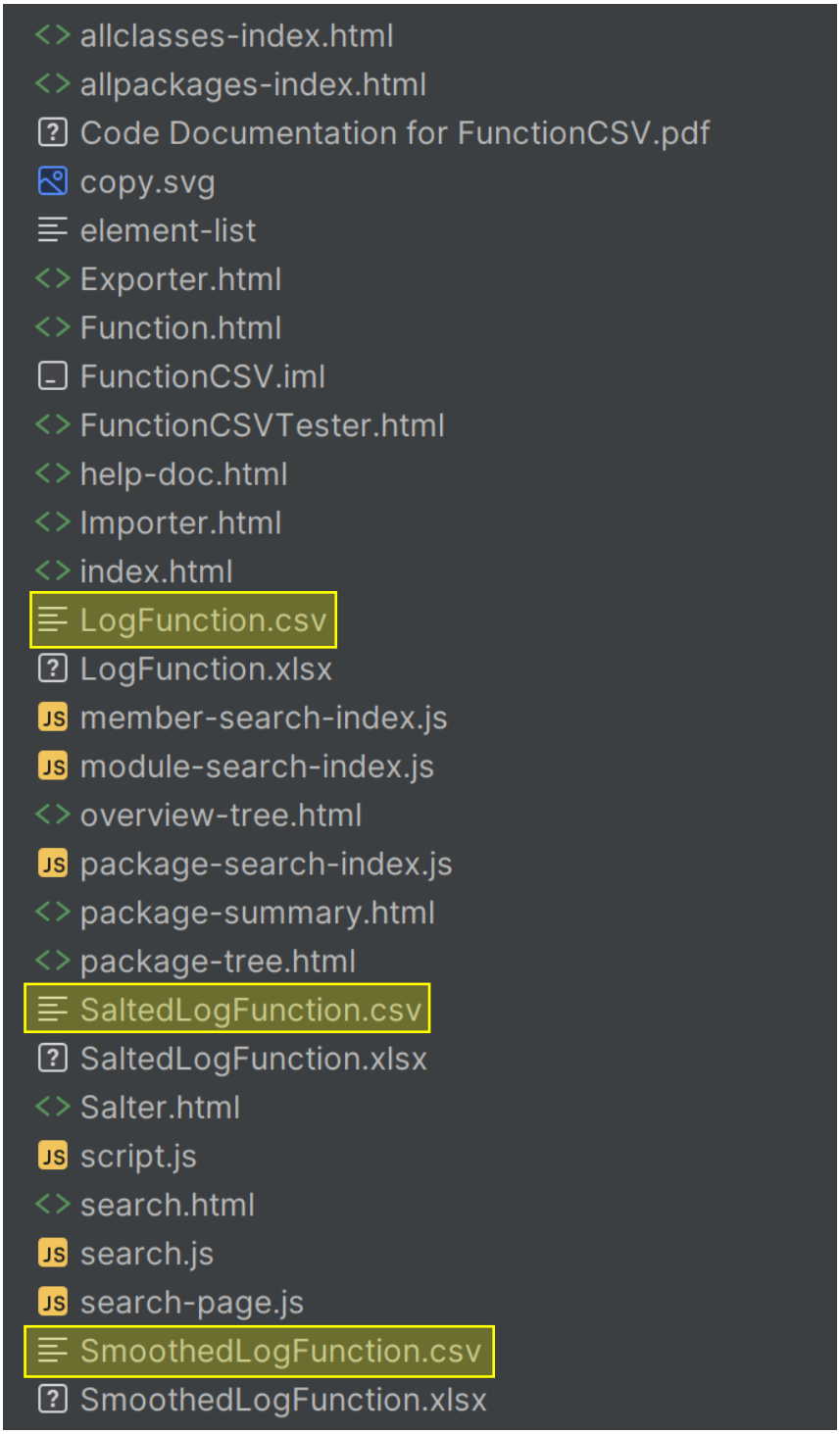
FunctionCSVTester

The FunctionCSVTester class contains the main method and is used to test the methods from the Exporter, Function, Importer, Salter, and Smoother classes.

Output

Screenshots

Screenshot of the files in the Project2 directory



Contents of the LogFunction.csv

```
X,Y,
1,0.0000,
2,0.6931,
3,1.0986,
4,1.3863,
5,1.6094,
6,1.7918,
7,1.9459,
8,2.0794,
9,2.1972,
10,2.3026,
11,2.3979,
12,2.4849,
```

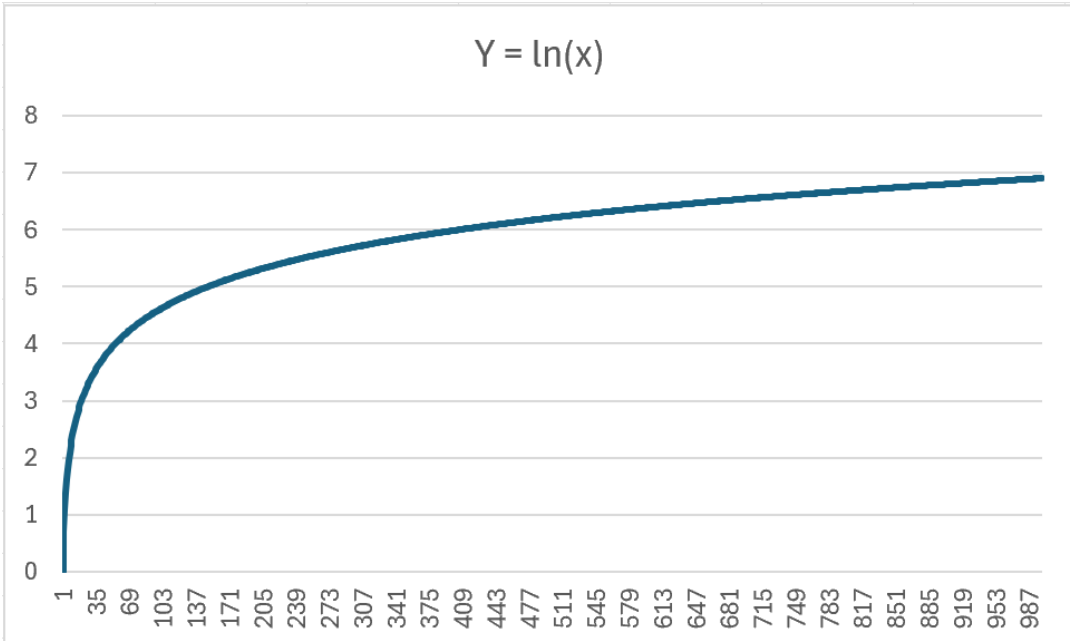
Contents of the SaltedLogFunction.csv

```
X,Y,
1,-446.0000,
2,127.6931,
3,-436.9014,
4,-238.6137,
5,-115.3906,
6,-177.2082,
7,-274.0541,
8,420.0794,
9,-400.8028,
10,-257.6974,
11,114.3979,
12,276.4849,
13,241.5649,
```

Contents of the SmoothedLogFunction.csv

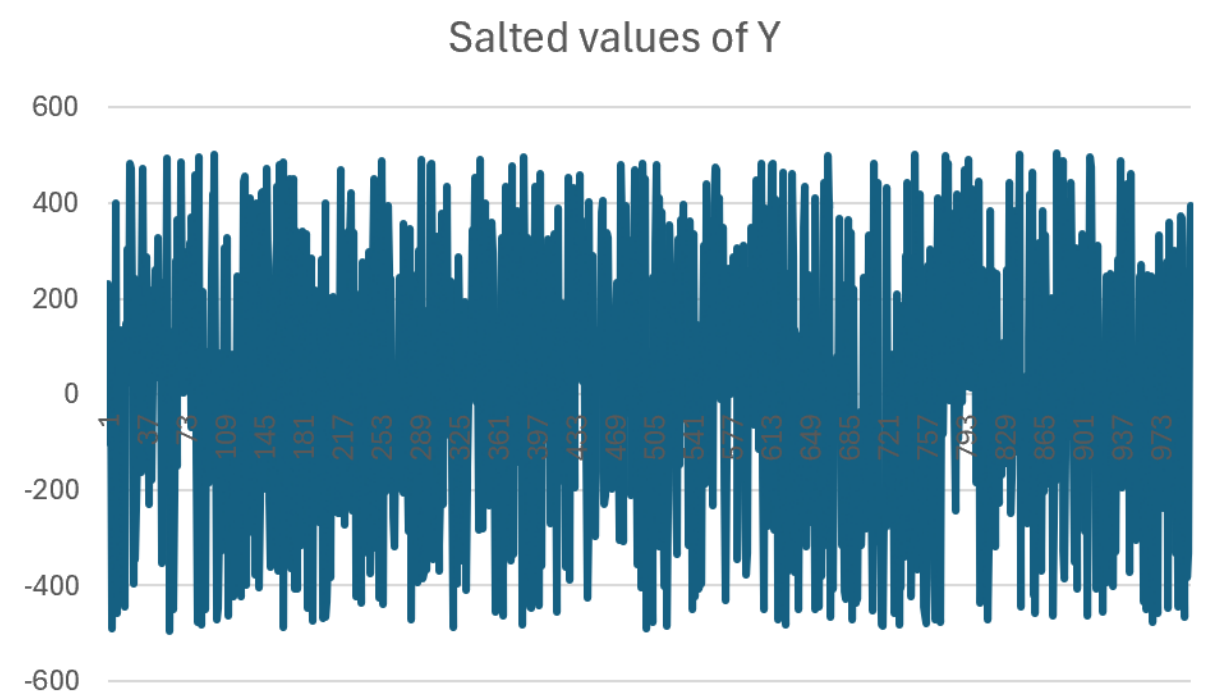
```
X,Y,
1,-154.1198,
2,38.1235,
3,69.8921,
4,75.6974,
5,-59.8755,
6,103.1056,
7,89.7562,
8,-35.1148,
9,-215.4021,
10,121.6982,
11,63.6883,
12,-78.4298,
```

Excel chart of the log function

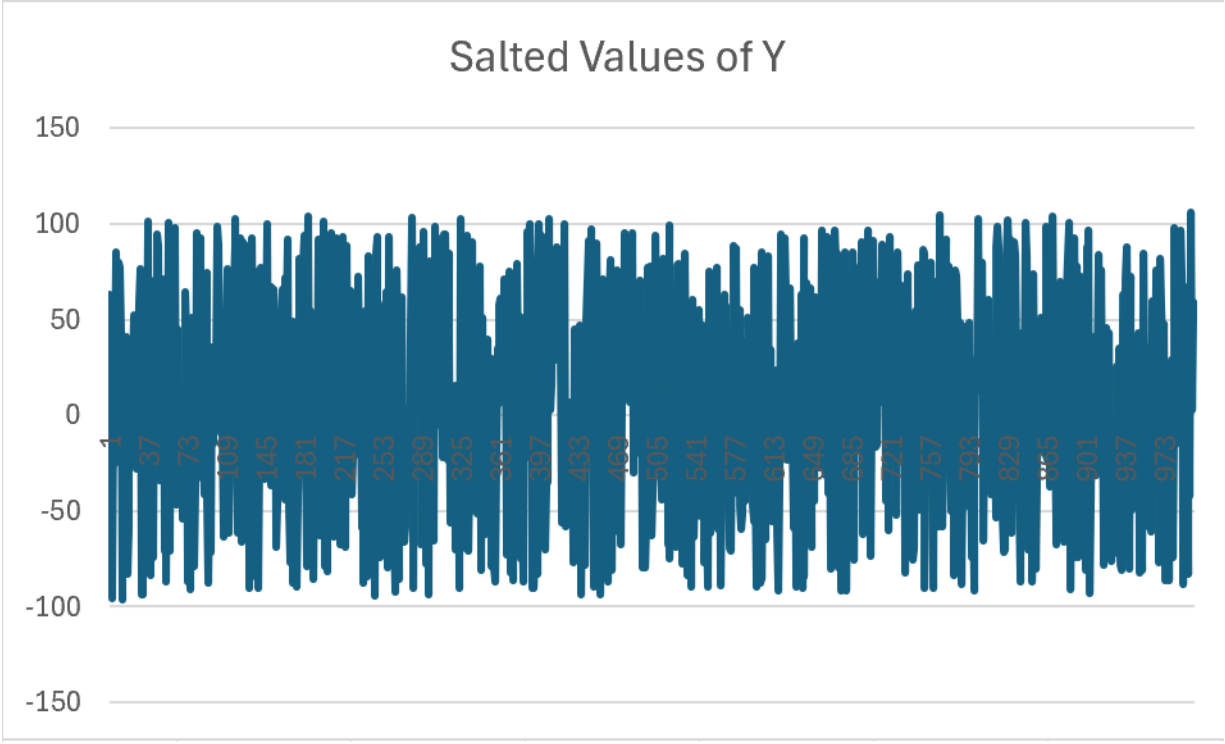


Experimenting with different values for different features

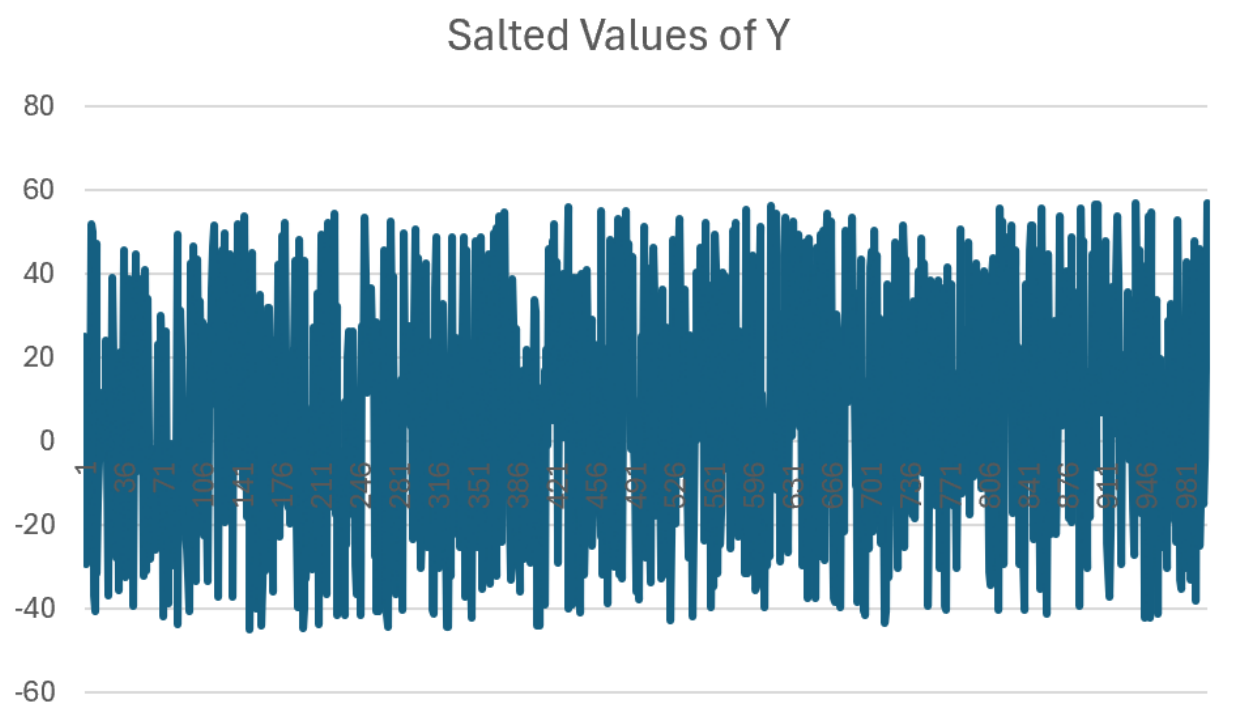
Salted values of Y when the bound of the salter was -500 to 500



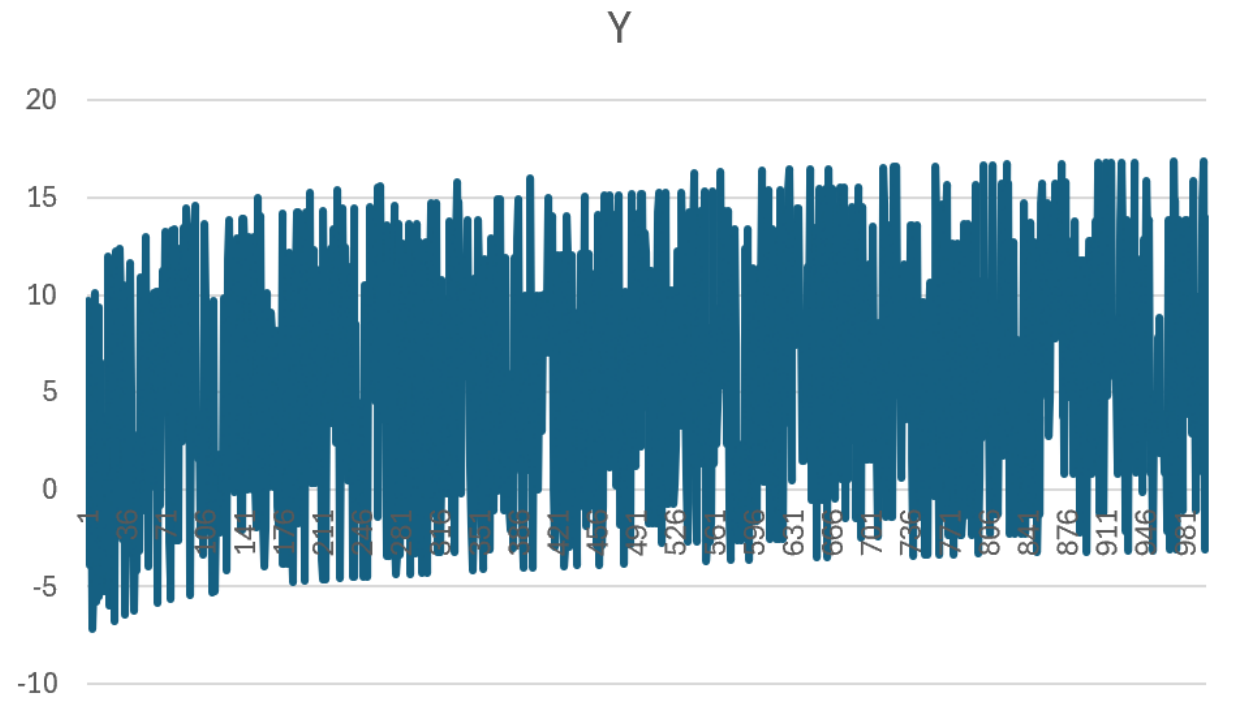
Salted values of Y when the salter bounds were -100 to 100



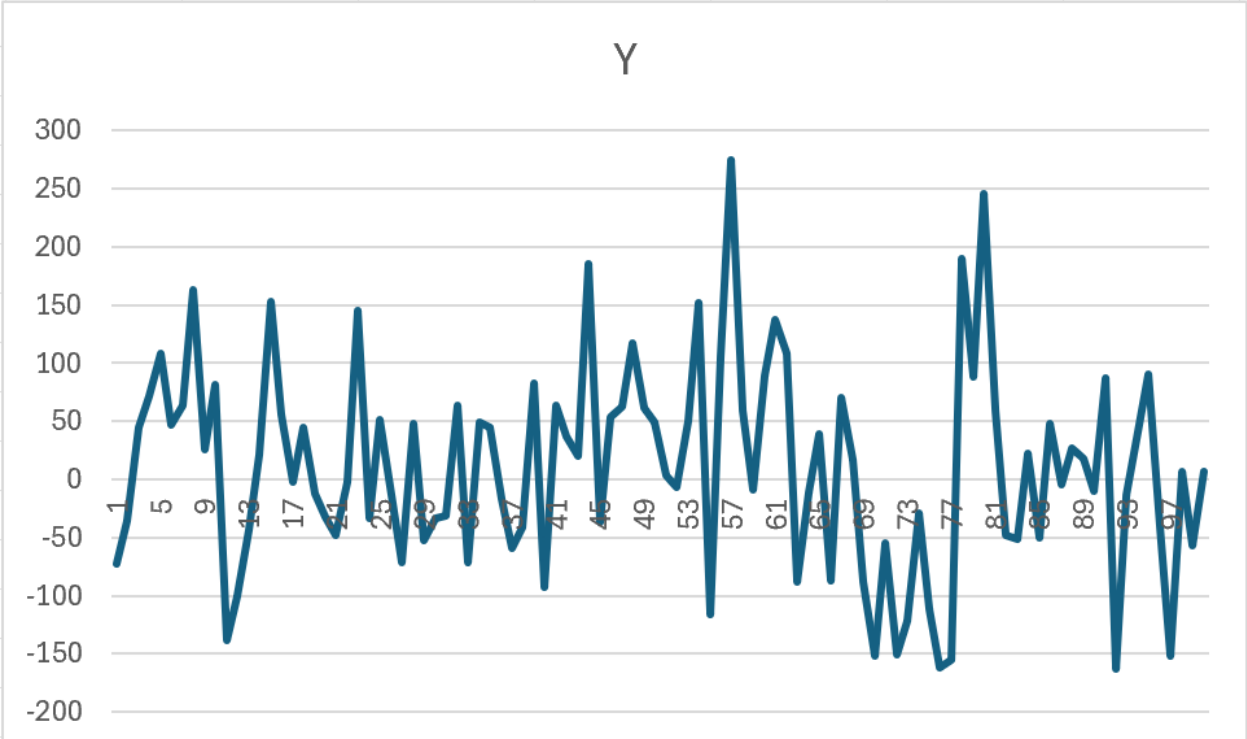
Salted values of Y when the salter bounds were -50 to 50



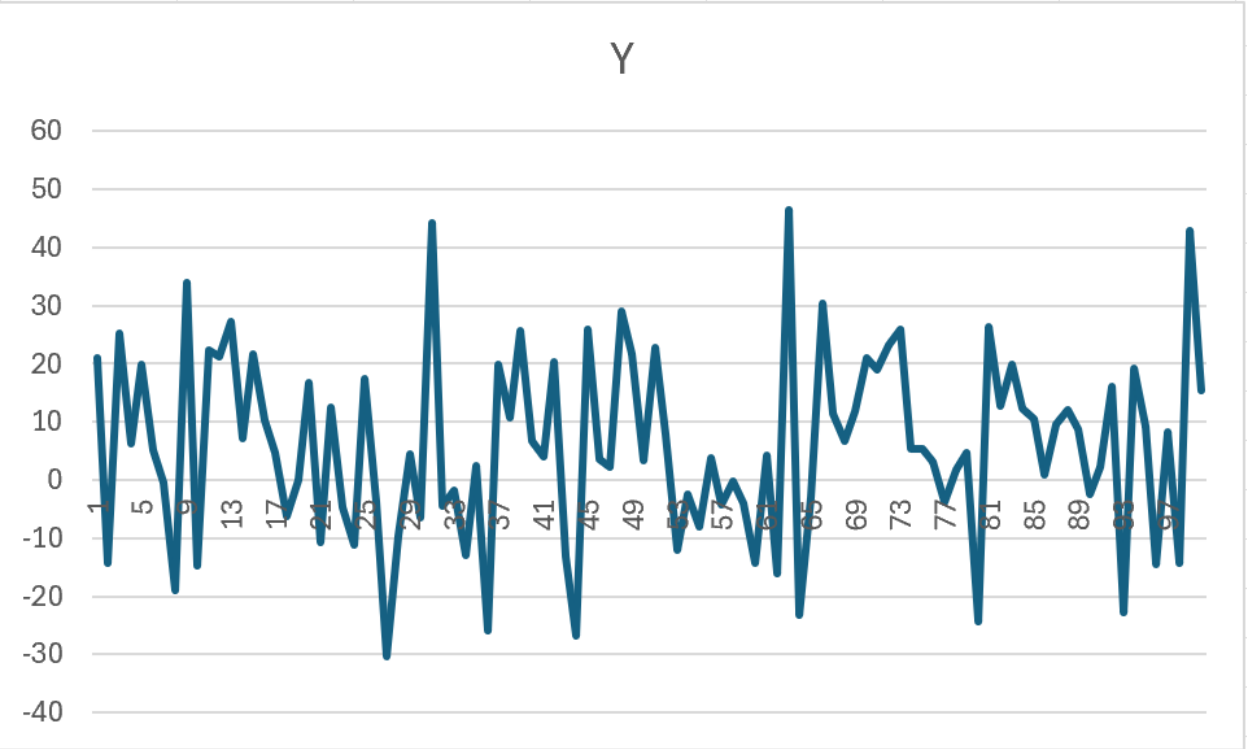
Salted values of Y when the salter bounds were -10 to 10



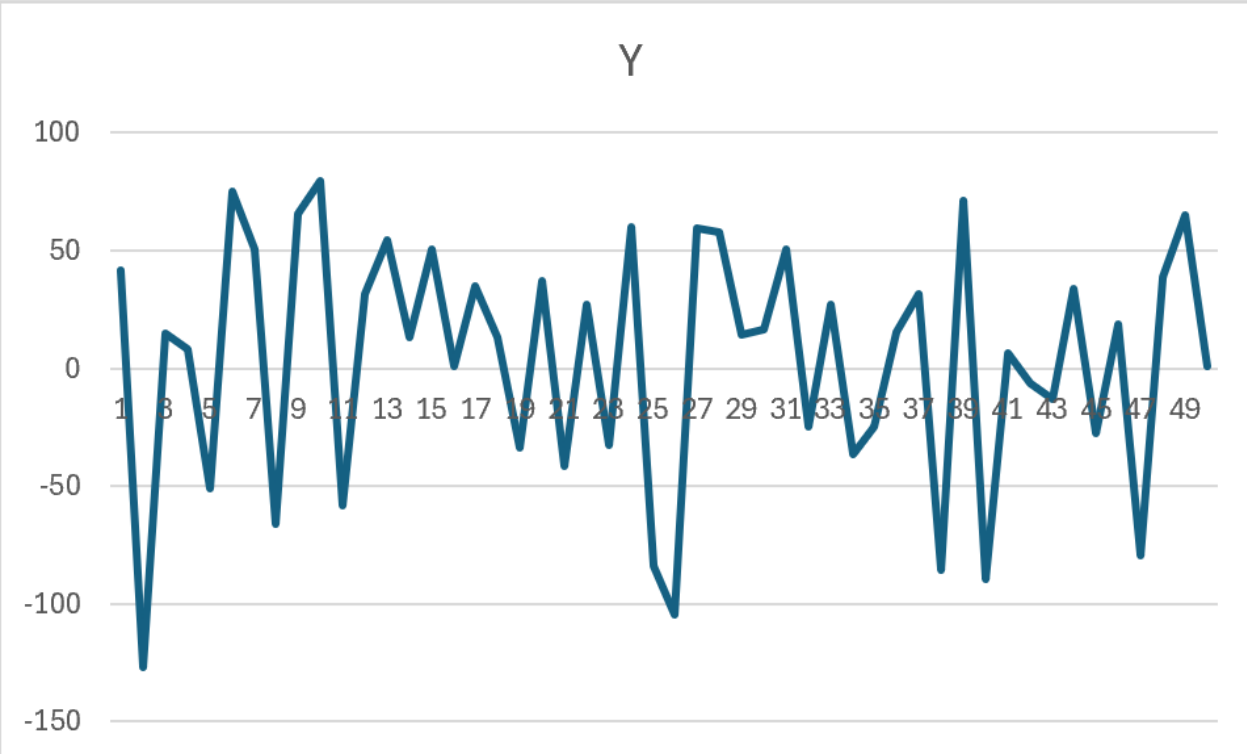
Smoothed Log Function Using windowValue = 5 when salter bound was -500 to 500



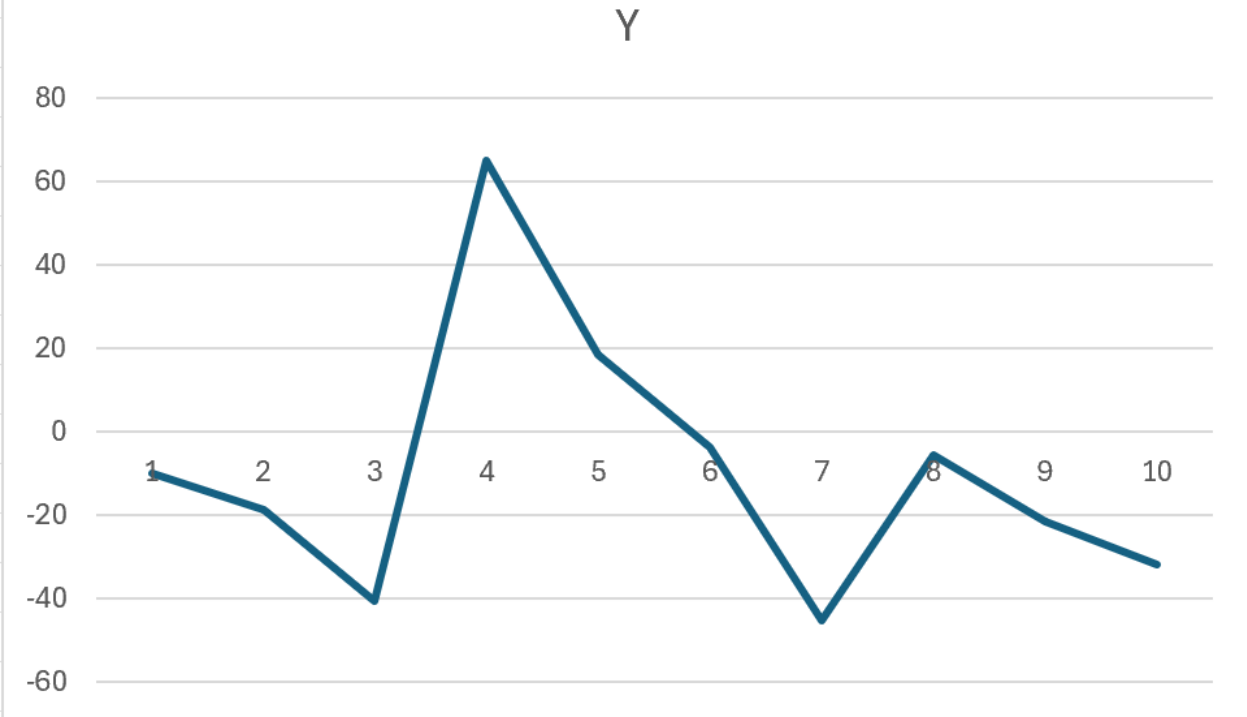
Smoothed Log Function Using windowValue = 5 when salter bound was -100 to 100



Smoothed log function with Salter bound -500 to 500 and windowValue = 10



Smoothed log function with Salter bound -500 to 500 and windowValue = 50



Smoothed log function with Salter bound -10 to 10 and windowValue = 50