

Use Mathematica to develop a formula for the integral of the Lagrange polynomial with degree two passing through the points (x_1, y_1) , (x_2, y_2) and (x_3, y_3) . Substitute $x_2 = x_1 + h$ and $x_3 = x_1 + 2h$.

Use your formula to write a C++ program that approximates the numerical integral of a function given by evenly spaced $(x, f(x))$ pairs. Use your program with the given input files.

Turn in:

- This problem sheet with your name.
- A summary sheet explaining what you did, how you approached the problem, what was accomplished, what was not accomplished, etc.
- The output values and the formula used by your program.
- Printout of your Mathematica notebook used to find the formula.

Website:

- Create a directory called `9integral` on your web site and make all your input, output and source files available in this directory. Write the url for the website on this problem sheet.

Input:

Two columns containing $x, f(x)$ pairs. The x -values are equally spaced.

Output:

The integral of the function.

Sample input:

```
0 2
1 2
2 2
3 2
4 2
```

Sample output:

```
8
```

Hints:

- Do not hardwire the distance h between the x -values. Calculate it from the first two points.
- Try to use the makefile I created for this project.
- The formula should be simple. You may need to use the `simplify` mathematica command.
- Think about the problem of having an even number of points in the input file. How should we deal with that?
- Since we approximate the function by pieces of quadratic functions, the value of the integral should be exact for any quadratic function.