Homework 3 – Integrate and calculate the error of the following integral:

# Evaluating the integral with just calculus, the result is shown:

The error for this method is none since it is the integral value.

# Evaluating the integral via the trapezoidal method with intervals of .05:

Using the following program:

#include <iostream>

#include <cmath>

#include <iomanip>

using namespace std;

int main()

{

long double i = -1, f = 1, f\_x = 0, dx = .05, Sum = 0, Integral = 0;

long double f\_i = 4 \* pow(-1, 3) + 3 \* (-1) + 1;

while (i < (f - dx))

{

i = i + dx;

f\_x = 4 \* pow(i, 3) + 3 \* i + 1;

Sum = Sum + f\_x;

};

long double f\_f = 4 \* pow(1, 3) + 3 \* (1) + 1;

Integral = (.5\*f\_i + Sum + .5\*f\_f)\*dx;

cout << Integral << endl;

return 0;

}

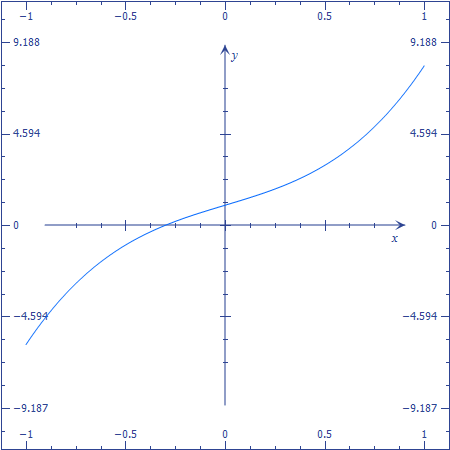
The result is that no matter what dx is chosen, the integral value will always be 2, as long as the dx can properly divide the interval.

# Evaluating the integral via Simpson’s Rule:

The Simpson’s Rule seems to give the same answer like the other two methods.

# Final Comments:

Because of the nature of the integral in the interval it is in:



It is almost linear and that is why all the integration methods have been showing to be this accurate. The error is 0 only because of this almost linear behavior.