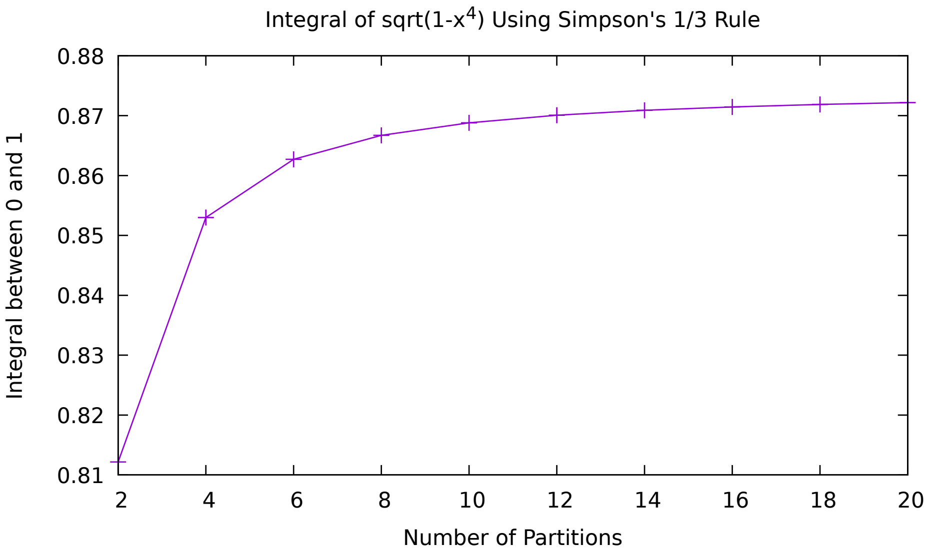
Assignment 2 Write-Up

Lessons Learned About Floating-Point Numbers

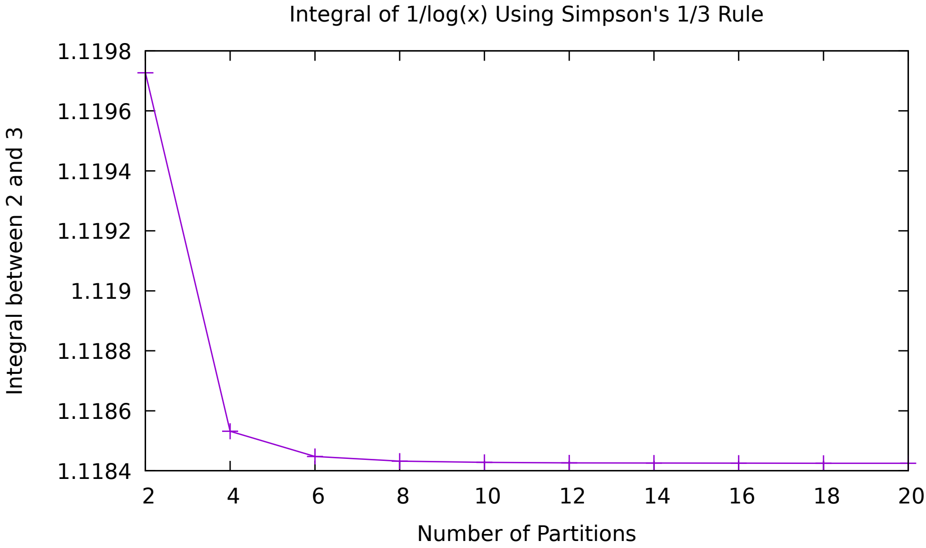
- In this assignment, we used data types of type double for floating point numbers.
- I had some difficulties in the beginning to print with the desired precision.
- I read the books and looked up on stackoverflow to learn how to print it with higher precision.
- I also tried to implement the Simpson's algorithm in two different ways:
  - The implementation that I am submitting.
  - The implementation based on the description given in the text. Here, my loop ran from i = 0 to i = n/2 - 1, and I added a term at the end for x_{n-1}.
- The results were quite similar, but slightly different in some cases. I think it is due to the fact that the h value is not precise when the intervals are values like pi. So, a + (n-1)*h can be different than b - h.

GNU Plot Analyses

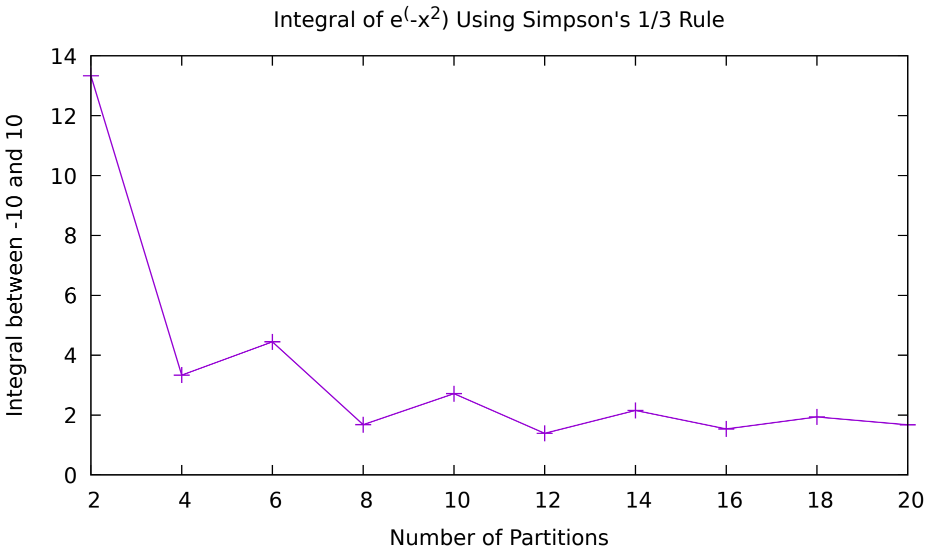
The GNU plots are included at the end of the document. In most cases we see that the integral converges quickly. In some cases, it oscillates a few times before converging. The graph for the final function sqrt(sin^2(x)+cos^2(x)) is misleading. The difference between partitions 2 and 20, and everything in between is extremely small. So, while the graph suggests that there are large variations and no convergence, the results actually are exactly the opposite.



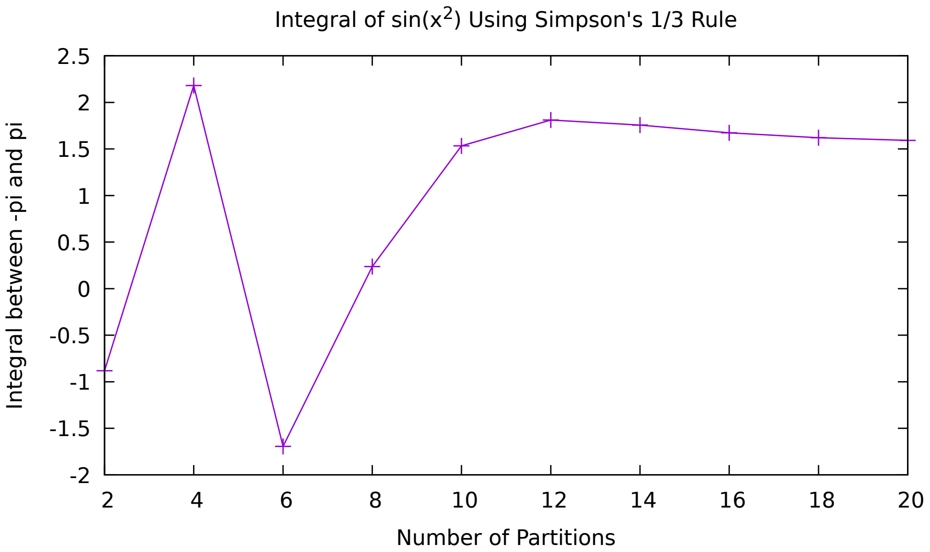
Integral of sqrt(1-x^4) Using Simpson's 1/3 Rule
0.88
0.87
0.86
0.85
0.84
0.83
0.82
0.81
2
4
6
8
10
12
14
16
18
20
Integral between 0 and 1
Number of Partitions

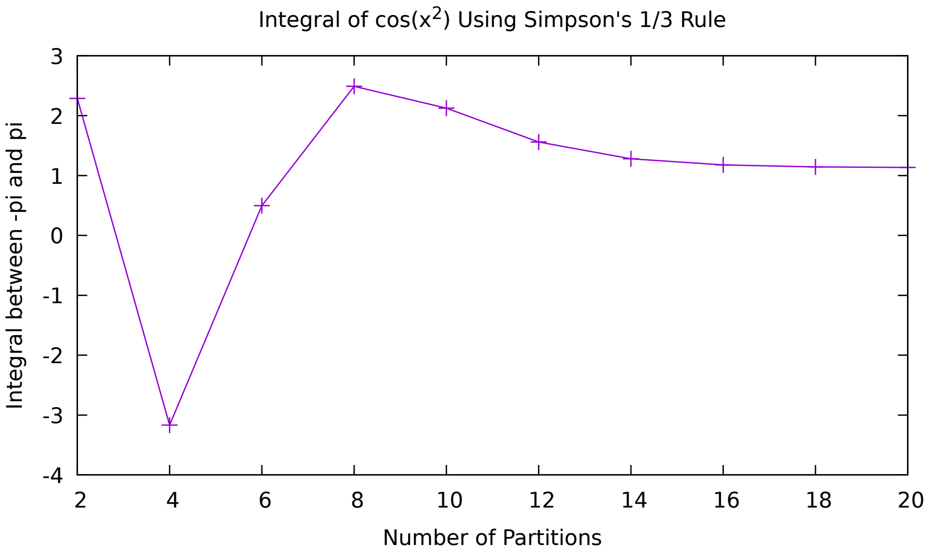


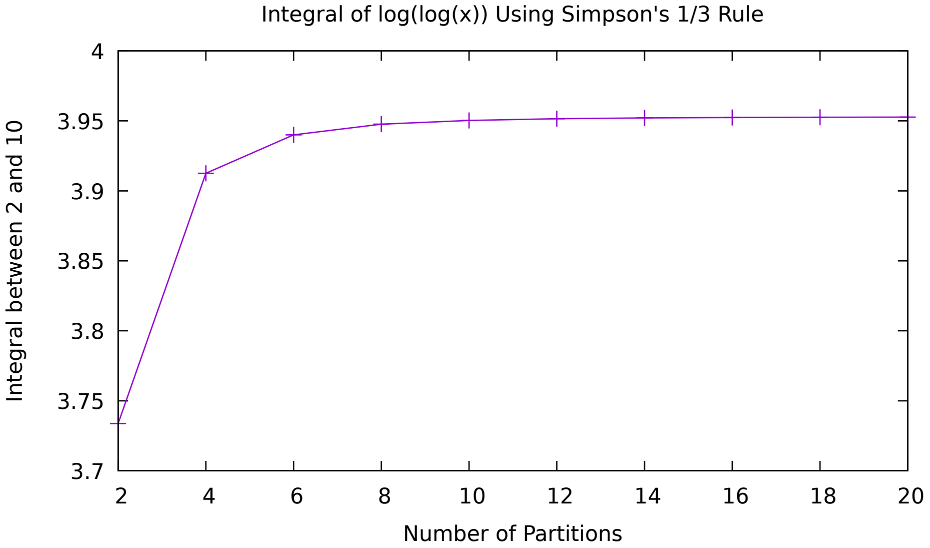
Integral of 1/log(x) Using Simpson's 1/3 Rule
Integral between 2 and 3
Number of Partitions
1.1198
1.1196
1.1194
1.1192
1.119
1.1188
1.1186
1.1184
2
4
6
8
10
12
14
16
18
20



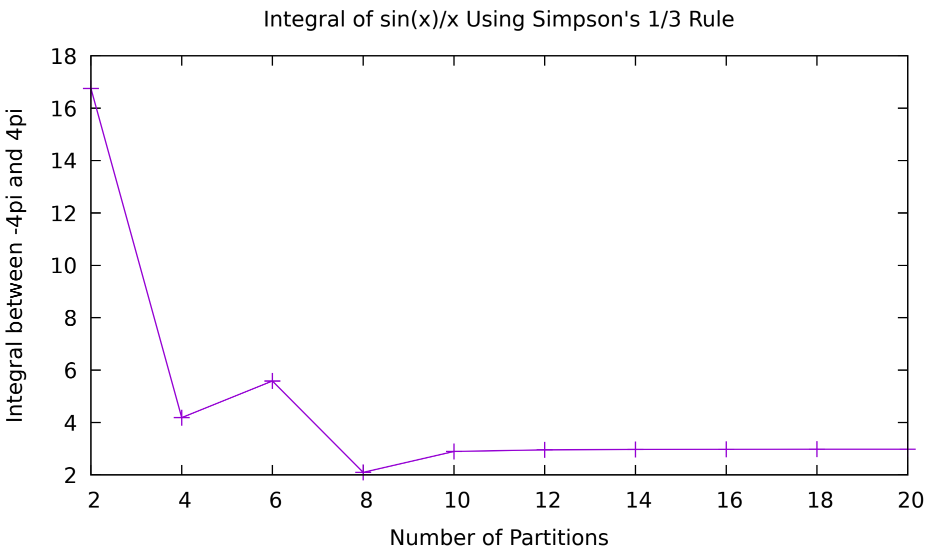
Integral of e^(-x^2) Using Simpson's 1/3 Rule
Integral between -10 and 10
Number of Partitions
0
2
4
6
8
10
12
14
16
18
20


Integral of sin(x2) Using Simpson's 1/3 Rule
Integral between -pi and pi
Number of Partitions
2.5
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
2
4
6
8
10
12
14
16
18
20

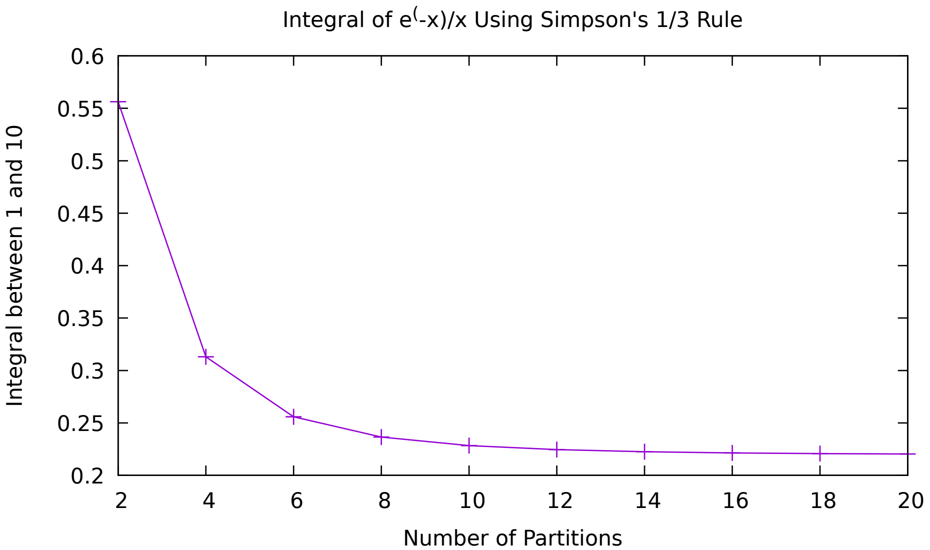

Integral of cos(x2) Using Simpson's 1/3 Rule
Integral between -pi and pi
Number of Partitions
3
2
1
0
-1
-2
-3
-4
2
4
6
8
10
12
14
16
18
20

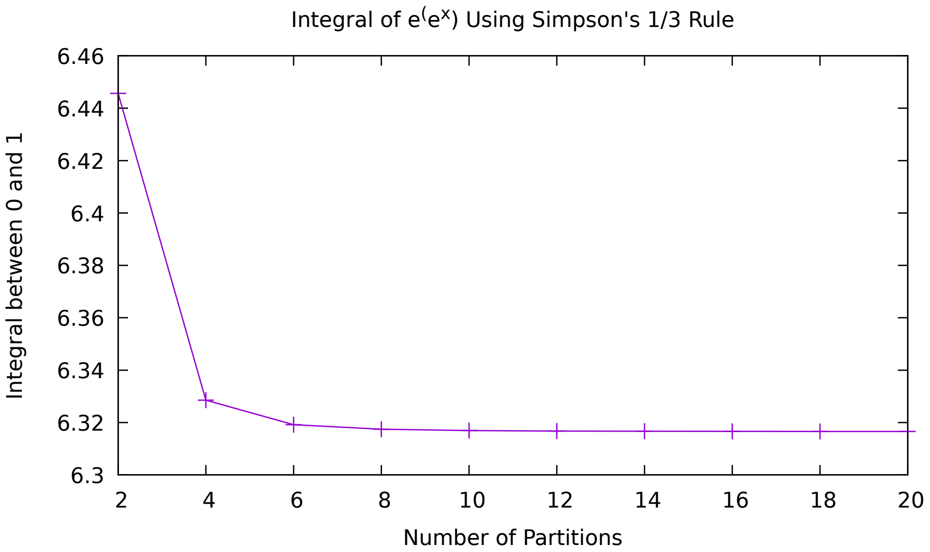


Integral of log(log(x)) Using Simpson's 1/3 Rule
Integral between 2 and 10
Number of Partitions
4
3.95
3.9
3.85
3.8
3.75
3.7
2
4
6
8
10
12
14
16
18
20

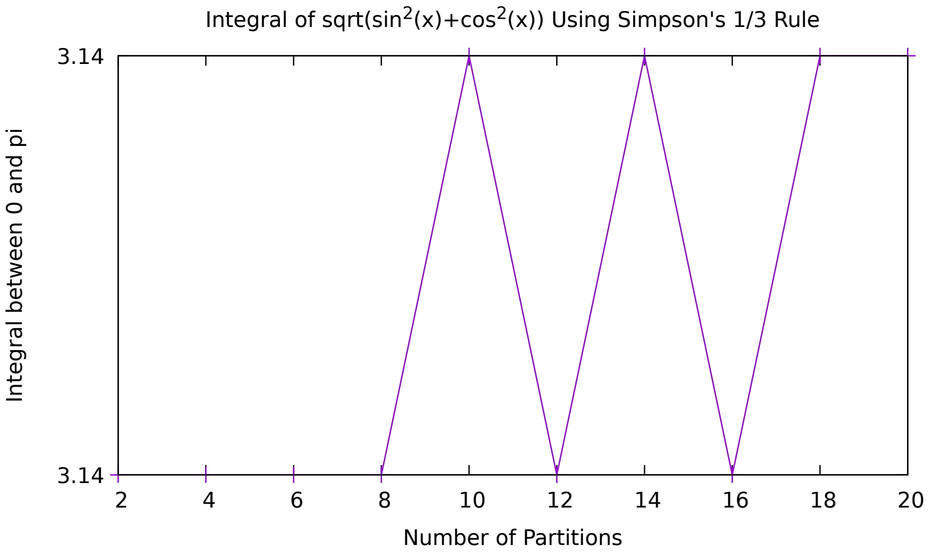


Integral of sin(x)/x Using Simpson's 1/3 Rule
Integral between -4pi and 4pi
Number of Partitions
2
4
6
8
10
12
14
16
18
20


Integral of e^(-x)/x Using Simpson's 1/3 Rule
Integral between 1 and 10
Number of Partitions
0.6
0.55
0.5
0.45
0.4
0.35
0.3
0.25
0.2
2
4
6
8
10
12
14
16
18
20



Integral of e^(e^x) Using Simpson's 1/3 Rule
6.46
6.44
6.42
6.4
6.38
6.36
6.34
6.32
6.3
Integral between 0 and 1
2
4
6
8
10
12
14
16
18
20
Number of Partitions



Integral of sqrt(sin^2(x)+cos^2(x)) Using Simpson's 1/3 Rule
3.14
3.14
2
4
6
8
10
12
14
16
18
20
Number of Partitions
Integral between 0 and pi