ME766: Assignment 1

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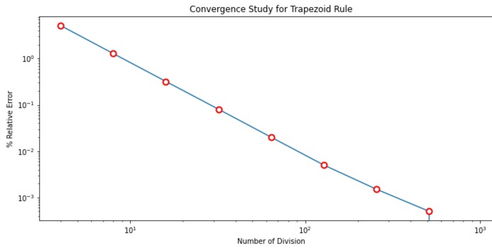
Analytical Integral

$$\begin{aligned}\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} f(x)dx &= \int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \cos(x)dx \\ &= \Big[sin(x)\Big]_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \\ &= \sin\left(\frac{\pi}{2}\right) - \sin\left(-\frac{\pi}{2}\right) \\ &= 2\end{aligned}$$

Convergence Study

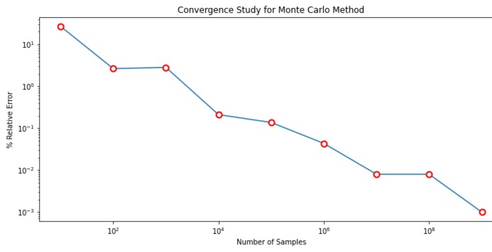
Trapezoid Rule

Divisions	Integral	% Error
4	1.89612	5.194
8	1.97423	1.2885
16	1.99357	0.3215
32	1.99839	0.0805
64	1.9996	0.02
128	1.9999	0.005
256	1.99997	0.0015
512	1.99999	0.0005
1024	2	0



Monte Carlo Method

Samples	Integral	% Error
10	2.53822	26.911
100	2.0529	2.645
1000	1.94344	2.828
10000	1.99578	0.211
100000	1.99725	0.1375
1000000	1.99913	0.0435
10000000	1.99984	0.008
100000000	1.99984	0.008
1000000000	1.99998	0.001



Timing Study

Experiment	Average Time (ms)
Trapezoid Serial	884
Trapezoid Parallel 2 Threads	472.6
Trapezoid Parallel 4 Threads	331.4
Trapezoid Parallel 6 Threads	295.2
Trapezoid Parallel 8 Threads	236.4
Monte Carlo Serial	3423.4
Monte Carlo Parallel 2 Threads	1782.6
Monte Carlo Parallel 4 Threads	1121.8
Monte Carlo Parallel 6 Threads	1085.6
Monte Carlo Parallel 8 Threads	1080.2