CSE5004 Scientific Computation with Python

HW4. Numerical Integration

Due date: May 2, 2023

Consider the integral: $f(x) = \int_0^\pi \sin(x)dx$.

1. Use Simpson's rule and Gaussian quadrature (with 2, 3, or 4 nodes) to calculate the integral using $4, 8, 16$, and 32 intervals. Plot the error versus the number of points in a log-log plot.
2. Develop a quadrature method based on cubic spline interpolation.
3. Use the cubic spline-quadrature method developed in part 2 to calculate the integral. Discuss the error for numerical integrations by varying the number of intervals.
4. Use the Monte-Carlo method to calculate the integral.