GA_4: Numerical Integration

ME 273 | Spring Semester 2018

Project Exercise

Analytically compute the value of

$$I = \int_0^{10} \sin x \, dx. \tag{1}$$

Then use your left-hand Riemann sum rule, the Trapezoid rule, and the Simpson13 rule to compute the integral numerically, using a range of step sizes Δx from 10^0 to 10^{-8}. (It will probably be easiest if you automate this last process by using a for loop to cycle through the various values of your step size; don't forget to reset your accumulator after each integral.) Make a log-log plot of the error (magnitude of the difference between the analytic and numeric answers) vs. the step size Δx. Ensure that the interval (0,10) can be divided evenly into intervals of the step size you choose! Do the graphs look like you expect them to? How do you explain their behavior for large step sizes? For very small step sizes? How do you interpret their slopes?