Trapezoidal Rule for Numerical Integration

- • Approximates an integral by dividing the area under the curve into trapezoids.
- • Formula:
- $I \approx \Sigma (h/2) * [f(x_i) + f(x_{i+1})]$, where $h = (b-a)/N$
- • Steps:
- 1. Divide the interval into N trapezoids.
- 2. Compute function values at subinterval endpoints.
- 3. Sum the areas of the trapezoids.

Monte Carlo Integration

- • Uses random sampling to approximate an integral.
- • Formula:
- $I \approx (1/N) \Sigma f(x_i)$, where x_i are random samples in the domain.
- • Steps:
- 1. Generate N random points in the integration region.
- 2. Compute function values at each point.
- 3. Average the values to estimate the integral.

- • Pros:
- ✓ Works well for high-dimensional problems
- ✓ Can handle irregular regions
- • Cons:
- ✗ Slower convergence than deterministic methods