Computational Methods in Physics (PHY 365)

FA23

Dr. Muhammad Kamran

Department of Physics

COMSATS University Islamabad

Lab 14

MATLAB's quadgk function

- q = quadgk(fun , a , b) integrates the function handle "fun" from "a" to "b" using high-order global adaptive quadrature and default error tolerances.

MATLAB's quadgk function

- q = quadgk(fun , a , b) integrates the function handle "fun" from "a" to "b" using high-order global adaptive quadrature and default error tolerances.

- [q , errbnd] = quadgk(fun , a , b) additionally returns an approximate upper bound on the absolute error $|q - I|$, where I is the exact value of the integral.

MATLAB's quadgk function

- q = quadgk(fun , a , b) integrates the function handle "fun" from "a" to "b" using high-order global adaptive quadrature and default error tolerances.

- [q , errbnd] = quadgk(fun , a , b) additionally returns an approximate upper bound on the absolute error $|q - I|$, where I is the exact value of the integral.

- [_____] = quadgk(fun , a , b , Name , Value) specifies additional options with one or more name-value pair arguments using either of the previous output argument combinations.

MATLAB's quadgk function

- Problem: Compute the following integral using quadgk function.

$$I = \int_0^\infty \frac{1}{x^3 - 2x - 5}\, dx.$$

MATLAB's quadgk function

- Problem: Compute the following integral using quadgk function.

$$I = \int\limits_{0}^{\infty} \frac{1}{x^3 - 2x - 5} \, dx.$$

- The interval

  x_lower = 0;

  x_upper = inf;

MATLAB's quadgk function

- Problem: Compute the following integral using quadgk function.

$$I = \int_0^\infty \frac{1}{x^3 - 2x - 5} dx.$$

- The interval

  x_lower = 0;

  x_upper = inf;

- The integrand

  f = @ (x)   1 ./ (x   ^ 3 − 2 * x − 5);

MATLAB's quadgk function

- Calling the quadgk function

  quad_int = quadgk(f , x_lower , x_ upper);

MATLAB's quadgk function

- Calling the quadgk function

  quad_int = quadgk(f , x_lower , x_upper);

- Displaying the result

  fprintf('The approximate value of the integral is %3.4f \n', quad_int)

MATLAB's triplequad function

- q = triplequad(fun , xmin , xmax , ymin , ymax , zmin , zmax) evaluates the triple integral over the three dimensional rectangular region xmin ≤ x ≤ xmax, ymin ≤ y ≤ ymax, zmin ≤ z ≤ zmax.

  ◇ The first input, "fun", is a function handle.
  ◇ fun(x , y , z) must accept a vector x and scalars y and z, and return a vector of values of the integrand.

MATLAB's triplequad function

- q = triplequad(fun , xmin , xmax , ymin , ymax , zmin , zmax) evaluates the triple integral over the three dimensional rectangular region $xmin \leq x \leq xmax$, $ymin \leq y \leq ymax$, $zmin \leq z \leq zmax$.

  - The first input, "fun", is a function handle.
  - fun(x , y , z) must accept a vector x and scalars y and z, and return a vector of values of the integrand.

- q = triplequad(fun , xmin , xmax , ymin , ymax , zmin , zmax , tol) uses a tolerance tol instead of the default.

MATLAB's triplequad function

- q = triplequad(fun , xmin , xmax , ymin , ymax , zmin , zmax) evaluates the triple integral over the three dimensional rectangular region xmin ≤ x ≤ xmax, ymin ≤ y ≤ ymax, zmin ≤ z ≤ zmax.

  - ◇ The first input, "fun", is a function handle.
  - ◇ fun(x , y , z) must accept a vector x and scalars y and z, and return a vector of values of the integrand.

- q = triplequad(fun , xmin , xmax , ymin , ymax , zmin , zmax , tol) uses a tolerance tol instead of the default.

- q = triplequad(fun , xmin , xmax , ymin , ymax , zmin , zmax , tol , method) uses the quadrature function specified as method, instead of the default quad.

References

- https://www.mathworks.com/help/matlab/ref/quadgk.html

- https://www.mathworks.com/help/matlab/ref/triplequad.html

- https://en.wikipedia.org/wiki/Gauss%E2%80%93Kronrod_
  quadrature_formula