ZCE 111
Assignment 9

Q1 Trapezoid rule for numerical integration

•Write a code to evalate the following integral using both Trapezoid rule. z is a constant set to 1. Let the integration limits be from x_0=-1.5 to x_1=+5.0.

$$f(x)=\frac{x}{(z^2+x^2)^{3/2}}$$

$$\int_{x_0}^{x_1} f(x)\,dx=?$$

Q2 Simpson's rule for numerical integration

•Write a code to evalate the following integral using both Simpson's rule. z is a constant set to 1. Let the integration limits be from x_0=-1.5 to x_1=+5.0.

$$f(x)=\frac{x}{\left(z^2+x^2\right)^{3/2}}$$

$$\int_{x_0}^{x_1} f(x)\,dx = ?$$

Q3 Numerical integration

- Logarithmic integral function is formally defined as
- $$li(x)=\int_0^x f(t)\,dt\,;f(t)=\frac{1}{\ln t}\,.$$
- http://functions.wolfram.com/GammaBetaErf/LogIntegral/02/
- (*i*) Use Mathematica command **LogIntegral[x]** to plot the function for the interval $0 < x < 1$ (note: the end points are not included).
- (*ii*) Use the command **Nintegrate[]** to generate a set of values {li(0.05),li(0.10),li(0.15), …, li(0.95)}.
- (*iii*) Overlap the ListPlot of (*ii*) on the graph plotted in (*i*). Both code must agree.

Q4 Numerical integration

- Gamma function is formally defined as
- $$\Gamma(z)=\int_0^{\infty} f(t)\,dt\,;f(t)=t^{z-1}e^{-t}\,;\Re(z)>0.$$
- http://functions.wolfram.com/GammaBetaErf/Gamma/02/
- (*i*) Use Mathematica command **Gamma[z]** to plot the gamma function for the interval $1 < z < 5$.
- (*ii*) Use the command **Nintegrate[]** to generate a set of values $\{\Gamma(1.00),\Gamma(1.05),\Gamma(1.10), \ldots, \Gamma(5.00)\}$.
- (*iii*) Overlap the ListPlot of (ii) on the graph plotted in (*i*). Both code must agree.

Q5 Stochastic integration

Develop a stochasitc integraton code which can integtate a function with both potisive and negative signs in the range of integration. Test it on the following integral. Set z=1. Let the integration limits be from x_0=-2.5 to x_1=+5.0.

$$f(x) = \frac{x}{\left(z^2 + x^2\right)^{3/2}}$$

$$\int_{x_0}^{x_1} f(x)\,dx = ?$$