Lab 9

Quadrature formulas (2)

1. a) Use the rectangle formula to evaluate the integral

$$\int_{1}^{1.5} e^{-x^2} dx.$$

b) Plot the graph of the function f and the graph of the rectangle which area approximates the integral, using rectagle (midpoint) formula.

c) Use the repeated rectangle formula, for n=150 and 500, to evaluate the integral

$$\int_{1}^{1.5} e^{-x^2} dx.$$

(Result: 0.1094)

2. Consider the integral

$$\int_0^1 \frac{2}{1+x^2} dx.$$

a) Approximate the integral using the Romberg algorithm for trapezium formula, for precision $\varepsilon=10^{-4}$.

b) Approximate the integral using the Romberg algorithm in Aitken's form, for precision $\varepsilon=10^{-4}$.

3. Plot the graph of $f:[1,3]\to\mathbb{R},\ f(x)=\frac{100}{x^2}\sin\frac{10}{x}$. Use an adaptive quadrature algorithm for Simpson's formula to approximate the integral

$$\int_{1}^{3} f(x)dx,$$

with precision $\varepsilon=10^{-4}$. Compare the obtained result with the one obtained applying repeated Simpson's formula for n=50 and 100. (The exact value is -1.4260247818.)

1