INTERNATIONAL UNIVERSITY OF SARAJEVO

TUTORIAL 6
MATH205 NUMERICAL ANALYSIS
SPRING 2019

In this tutorial, you will practice using MATLAB to integrate functions, and learn about possible pitfalls of MATLAB in integration.

1. Perform quadratic integration of the function below. Use `quad(fun,0,3,1e-8,true)`

$$f(x) = \int_0^3 \frac{1}{x^3 - 2x - 5}\, dx$$

   a) Plot the function *f(x)* and comment on the results of integration! What do the different parameters of `quad` command stand for?
   b) Another MATLAB function for integration is `quadl`. Compare the results! Change the interval to 0-to-2 and compare again!
   c) Find other MATLAB functions for integration typing `help quad` and try them in an interval without singularities.

2. Write a function in m-file in MATLAB for numerical integration of *f(t)*

$$f(t) = \int_0^t \sin(x^3 - 7x)\, dx$$

3. Find solution of the integral using function quad

$$f(x) = \int_{-1}^1 \frac{1}{x}\, dx$$

   a) Plot the function *f(x)*
   b) Discuss the solution!

4. Create a vector of 6 equally spaced points in the interval `[0,1]`, and evaluate the function $y(x) = (1 + x)^{-1}$ at these points.

   a) Fit a polynomial of degree 5 to the 6 points
   b) Integrate the polynomial
   c) Plot in MATLAB the fitted polynomial
   d) Evaluate the original function and the polynomial fit on a finer grid of points between 0 and 2
   e) Plot the function values and the polynomial fit in the wider interval `[0,2]`, with the points used to obtain the polynomial fit highlighted as circles.
   f) Try to integrate (NOT in MATLAB) the function y(x) using trapeze, composite trapeze (4 points), Simpsons 1/3 and composite Simpsons 1/3 rule!