Numerical Analyis 3043 Lab #1

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Contents

1 MATLAB in a nutshell

This should serve as a brief introduction to MATLAB. Note that the double and triple percentage signs are defining documentation for the MATLAB file when publishing your code as an PDF or MS Word document (Explained below) respectively for defining MATLAB code sections or cells which can be executed independently if you open the example file `intro.m` in the workspace.

Listing 1: Example code for introducing MATLAB

```
%% MATLAB in a nutshell
% Note this code is to be stored in a file: nutshell.m
% This is a very brief and quick introduction to \textsc{MATLAB}
% Read also the corresponding sections in the \textsc{MATLAB} documentation
% MATLAB documentation can be found here: https://www.mathworks.com/help/matlab

%%% variables
alpha1 = 10 % scalar
vec1 = [1, 2, 3] % row vector
vec2 = [1; 2; 3] % column vector
xValues = 0:0.01:2*pi % range vector

%%% semicolon and comments
a = 10; % will define a and not print the value of a
a = 10 % will defien a and print the value of a
% everything after the percentage sign will be ignored
%{
 This is a multiline comment
 available from MATLAB 7 (R14)
 and may help to comment out a
 larger block of code instead of
 using single percentage signs
%}

%%% functions and evaluation
f = @(x) cos(x); % defines f(x) = cos(x)
f(2) % evaluates f(2), i.e. cos(2)
yValues = f(xValues); % evaluates all xValues

% 2d plotting
plot(xValues, yValues, 'k', 'LineWidth', 2) % What is 'k'?
axis([0, 2*pi, -1.5, 1.5]) % set axis limits
legend({'cos(x)'}, 'location', 'SouthWest') % legend
```

```
    position

%%% getting help / documentation
help plot
help doc

%%% conditional statements
a = randi([-10 10]);
b = randi([-10 10]);

fprintf('a = %d, b = %d, a*b = %d\n', a, b, a*b)

if a*b == 0
    fprintf('The product of a and b is zero\n')
elseif a*b <0
    fprintf('The product of a and b is negative\n')
else
    fprintf('The product of a and b is positive\n')
end

%%% for loop
for n = 1:1:10
   factorial(n)
end

%%% while loop
n = 0
while n <= 10
  factorial(n)
  n = n + 1;
end

%%% fprintf statement (\n: carriage return)
fprintf('This is some text\n'); % print the plain text
fprintf('A random number: %d\n', randi([0, 10])); % print
    a random whole number between 0 and 10
format long % show 16 significant digits
fprintf('Pi is: %f\n', pi);
fprintf('Pi is: %1.2f\n', pi) % 1 digit before decimal
   and 2 after
format short % show 6 significant digits
fprintf('Pi: %f\n', pi);

%%% publish this MATLAB file (default HTML)
publish('class1.m','pdf') % PDF
publish('class1.m','doc') % MS Word
```

2 Bisection method

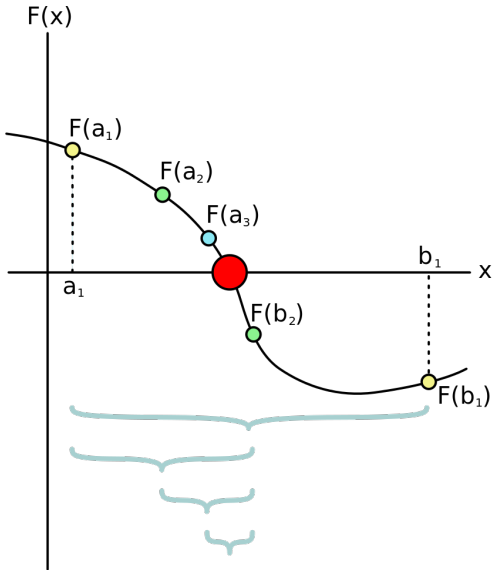

Figure 1: **Bisection method**: Few steps of the bisection method applied over the starting range $[a_1, b_1]$. The bigger red dot is the root of the function.

Listings