

## Chapter 4 Script M-files

Script files are a sequence of MATLAB commands stored as a separate program executable from the MATLAB workspace. They are ascii files created with a text editor and saved with a .m extension file name. Script files may contain calls to built-in functions, other script files or MATLAB function files. It is important to remember that all variables present in the MATLAB workspace, including those remaining from a previously executed program, are accessible to the commands in the script file and all variables created in the script file are stored in the MATLAB workspace.

Script files are executed by typing in the name of the file (without the extension) at the MATLAB prompt in the Command window. The individual commands comprising the script file can be displayed by typing 'echo on' prior to running the script file or by including the command 'echo on' inside the script file.

The script file in Example 4.1 below would be entered a line at a time in the MATLAB Editor/Debugger window and then saved as 'Simple\_Statistics'. MATLAB will provide the .m extension designating it as a m-File. To run it, simply type the script file name 'Simple\_Statistics' in the Command window.

### Example 4.1

```
% Script file Simple_Statistics.m
% This file generates a vector of n random numbers uniformly
% distributed between 0 and 1. The numbers are transformed into
% uniformly distributed numbers over a new interval [a,b]. The built-
% in MATLAB functions 'mean' and 'std' for the sample mean and standard
% deviation are called and the values are compared to the theoretical
% values.

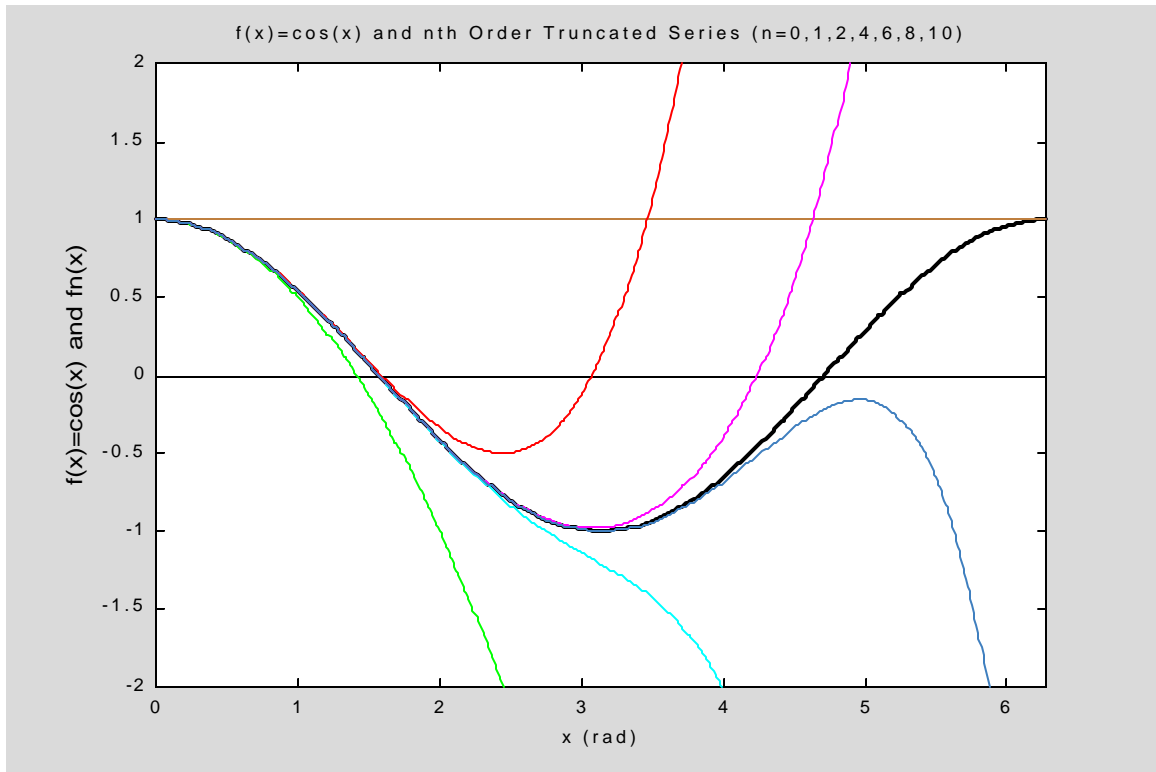
n=500; % Set sample size
x=rand(1,n); % Generate n U(0,1) random numbers
a=10; % Transformed lower limit
b=20; % Transformed upper limit
x=(b-a)*x+a; % Transformation from U(0,1) to U(a,b)
ave=mean(x); % Find mean sample
std_dev=std(x); % Find sample std deviation
ave_theoretical=(a+b)/2; % Compute theoretical mean
std_dev_theoretical=(b-a)/sqrt(12); % Compute theoretical std deviation
n,ave,std_dev,ave_theoretical,std_dev_theoretical

n = 500
ave = 15.0722
std_dev = 2.7907
ave_theoretical = 15
std_dev_theoretical = 2.8868
```

## Example 4.2

```
% Script file TaylorSeries.m
% This file plots the nth order truncated Taylor Series of f(x)=cos(x).
% The truncated series fn(x),n=0,...,10 are expanded about the point x0.
% All graphs including f(x)=cos(x) are plotted from 0 to 2*pi radians.

clear
clc
x0=0;
x=0:0.01:2*pi;
v=[0 2*pi -2 2];
z=zeros(size(x));
plot(x,z,'k')
axis(v)
hold on
fx=cos(x);
plot(x,fx,'k','Linewidth',1.5)
xlabel('x (rad)')
ylabel('f(x)=cos(x) and fn(x)')
title('f(x)=cos(x) and nth Order Truncated Series (n=0,1,2,4,6,8,10)')
axis manual
fx0=cos(x0);
plot([x0 x0],[0 fx0],'k--')
fp1=-sin(x0);
fp2=-cos(x0);
fp3=sin(x0);
fp4=cos(x0);
fp5=fp1;
fp6=fp2;
fp7=fp3;
fp8=fp4;
fp9=fp5;
fp10=fp6;
f0=fx0*ones(size(x));
f1=f0+fp1*(x-x0);
f2=f1+(fp2/2)*(x-x0).^2;
f3=f2+(fp3/6)*(x-x0).^3;
f4=f3+(fp4/24)*(x-x0).^4;
f5=f4+(fp5/120)*(x-x0).^5;
f6=f5+(fp6/720)*(x-x0).^6;
f7=f6+(fp7/5040)*(x-x0).^7;
f8=f7+(fp8/40320)*(x-x0).^8;
f9=f8+(fp9/362880)*(x-x0).^9;
f10=f9+(fp10/3628800)*(x-x0).^10;
plot(x,f0,'b')
plot(x,f1,'Color',[0.75 0.5 0.25])
plot(x,f2,'g')
plot(x,f4,'r')
plot(x,f6,'c')
plot(x,f8,'m')
plot(x,f10,'Color',[0.25 0.5 0.75])
```



### Example 4.3

```
% Script file Histo.m
% This script file plots a histogram of the data generated
% in script file Simple_Statistics.m which must be run prior
% to Histo.m.  Histo.m calls script file 'Simple_Statistics.m'
% and draws a 10 bin histogram of the data in vector x
```

```
Simple_Statistics
hist(x) % Draws a 10 bin histogram of the data in vector x
xlabel('x')
ylabel('Frequency of Occurrence')
title('Histogram')
```

```
n = 500
ave = 15.0722
std_dev = 2.7907
ave_theoretical = 15
std_dev_theoretical = 2.8868
```

