Overview of MATLAB

Variables, vectors, and matrices

Creating variables:

```
x=1;
```

Creating vectors:

```
rowVector=[1,2,3]; % row vector
columnVector=[1;2;3]; % column vector
```

Creating matrices:

```
matrix=[1,2,3;4,5,6];
```

Arithmetic operations

Basic arithmetic:

```
x=2;
sin(x)+cos(x)
sin(x)*cos(x)
sin(x)/cos(x)
```

If we have 2 vectors (a and b) and want to divide (multiply) each component of a by the corresponding component of b, then we have

```
a=[1,2,3];
b=[4,5,6];
division=a./b; % include ‘dot’ before ‘/’
product=a.*b;
dotProduct=a*transpose(b);
```

Matrix algebra

```
A = [1,2,3;4,5,6;7,8,9];
B = [0.11,0.2,0.3;0.4,0.5,0.6;0.7,0.8,0.9];
A/B % A times inverse of B
inv(B) % inverse of B
transpose(B)
```

Loops

```
numIterations=10;
x=zeros(1,numIterations);
x(1)=1;
for i=2:numIterations
x(i)=x(i-1)*3;
end
x
```

Conditionals

```
x=1;
f=sin(x);
if f<0
absF=1*f;
else
display('f is positive')
end
```

Functions

Anonymous functions:

```
f=@(x) x^2+exp(sin(x));
f(3)
```

For more complex functions we write a script (create a file with extension .m)

```
function [output1, output2] = testFunction(input1, input2, input3)
output1 = input1+input2;
output2 = input1+input3;
[output1,output2]=testFunction(1,2,3)
```

Plots

Create a 2-D plot

```
x=0:0.1:10;
f = x.^2;
plot(x,f)
```

!!!Please discuss how to plot more than one graph in the same plot using different colors.

Create a 3-D plot

```
[x,y]=meshgrid(0:0.1:1,0:0.1:2);
f=sin(x.^2)+cos(y.^2);
surf(x,y,f)
```

!!!Please also discuss how to add titles and axis labels.

Histograms

```
u=rand(1,100);
hist(u)
```

Numerical Integration

```
f=@(x) sin(x);
lowerLimit=0;
upperLimit=1;
integral(f,lowerLimit,upperLimit)
```

!!!Please emphasize that instead of f we could use an output of a script function.