Day 2 - MATLAB® m-files programming concepts

We have seen how to use MATLAB® as a calculator.
m-files give us a way to store the commands we would otherwise type into the MATLAB® calculator.

Create an m-file to evaluate the equation:
$y = 4x^3 - 24x^2 + 48\sqrt{x}$ for x = 0.75,

```
%Polynomial1.m
x = 0.75;
y = 4*x^3 - 24*x^2 + 48*sqrt(x);
disp(y);
```

Prints: 29.7567

Modify for x = 0, 0.1, 0.2, … 1.0.

```
%Polynomial1.m
x = 0:0.1:1.0;
y = 4*x.^3 - 24*x.^2 + 48*x.^(0.5);
disp(y);
```

Prints: 0 14.9429 20.5383 24.2387 26.7739 28.4411 29.4046 29.7717 29.6205 29.0128 28.0000

Modify to allow the user to input a value for x

```
%Polynomial1.m
x = input('Enter a value for x ...');
y = 4*x.^3 - 24*x.^2 + 48*x.^(0.5);
disp(y);
```

Prints:

```
Enter a value for x ...12
  3.6223e+003
```

If Statement

Syntax is:

```
if(logical expression)
   Statements to be done if logical expression is true
end
```

or,

```
if(logical expression)
   Statements to be done if logical expression is true
else
   Statements to be done if logical expression is false
end
```

If statements can also be *nested*. That is, you can have ifs within ifs indefinitely.

Example

```
%IfExample.m
x = input('Enter a value for x ...');
if(x >= 0)
    disp(sqrt(x));
else
    disp('Roots are imaginary.');
end
```

Write a MATLAB® mfile which will input a grade from the user between 0 and 100 and print a letter grade according to the scale 90-100 = A, 80-89 = B, 60-79 = C, 50-59 = D, and 0-49 = F

Loops – while and for

Syntax for while

```
initialize logical expression
while(logical expression is true)
   statements to be done while logical expression is true
   update logical expression
end
```

Example

```
i = 0;          %initialize
while(i < 10)
    disp(i);
    i = i + 1;  %update
end
```

Syntax of for

```
for counter = init:step:final
  Statements to be done while counter is not equal to final
end
```

Example

```
for i=1:.5:5
    disp(i);
end

for i = 1:10
    disp(i);
end
```

Write a MATLAB® mfile which will print the first 100 Fibonacci numbers.

Write a MATLAB® mfile which will find three numbers each of which is in the range of 1 to 99 such at $x^2 + y^2 = z^2$ AND $x + y + z = 1000$

```
for a = 1:999
    for b = 1:999
        for c = 1:999
           if ((a*a + b*b == c*c) && (a  + b  + c  == 1000))
              disp(['a = '  num2str(a)]);
              disp(['b = '  num2str(b)]);
              disp(['c = '  num2str(c)]);
           end
        end
    end
end
```

In MATLAB® loops can be implied:

```
t = -2*pi:pi/100:2*pi;
y = zeros(1, length(t));
for i = 1:length(t)
  y(i) = sin(t(i));
end
```

is the same as

```
t = -2*pi:pi/100:2*pi;
y = sin(t);
```

Do simple plot.