Reviewing previous session

**Practice time!**

### A. Logical Statements

In logical statements, 1 stands for “True” and 0 stands for “False”. Logical operators will operate on the logical values. Here we will discuss “and(&), or(|), xor, not, ==, >, <, >=, <=” operators.

Let’s see how they work:

- $1 \text{ and } 1 = 1$
- $1 \text{ or } 1 = 1$
- $1 \text{ xor } 1 = 0$
- $\text{not } 1 = 0$
- $1 \text{ and } 0 = 0$
- $1 \text{ or } 0 = 1$
- $1 \text{ xor } 0 = 1$
- $\text{not } 0 = 1$
- $0 \text{ and } 0 = 0$
- $0 \text{ or } 0 = 0$
- $0 \text{ xor } 0 = 1$

- $3 > 7 = 0$
- $2 < 5 = 1$
- $3 == 3 = 1$
- $3 >= 3 = 1$
- $4 <= 7 = 1$
- $5 <= 2 = 0$

Please note that MATLAB translate any number except zero as “True”.

Example:

- $-5 \text{ | } 0 = 1$
B. Loops and Conditional Statements

To create loops and conditional statements in MATLAB we use if, switch, for, continue, break, try-catch, return…
Here we will discuss some of the most important ones from this functions.

B.1. Conditional Statements

Here we will discuss if and switch conditional statements.

B.1.1. “if”

    if expression
    statements
    elseif expression
    statements
    else
    statements
    end

Example:

    if 3>5
    z=1
    else
    z=2
    end

    z =
    1

B.1.2. “switch”

    switch switch_expression
    case case_expression
    statements
    case case_expression

2
statements

... otherwise

statements

end

Example:
switch z
    case 1
        z2=100
    case 2
        z2=200
end

z2 =
    200

Practice time!

- Define x, y and z as 1 and 2 and 3 respectively. Write a code using if that checks the z and if it is larger than 10, subtracts x from y. Otherwise, adds x and y.

B.2. Loops

Here we will discuss for and while loops.

B.2.1. “for”

    for index = values
        statements
    end

Example 1:
for i=1:10
    i  % just show the value of i on the command window
end
Example 2:
\begin{verbatim}
a=0;
for i=1:5
    a=a+i
end
\end{verbatim}

B.2.1. “while”
\begin{verbatim}
while expression
    statements
end
\end{verbatim}

Example:
\begin{verbatim}
while j>0
    j=j-1
end
\end{verbatim}

Practice time!

- Try to find the value of y which is described below, using for loop. (the answer would be 140)
  \[ y = \sum_{i=1}^{7} i^2 \]

C. Symbolic variables in MATLAB

\texttt{syms x y z t ...}

This command changes its variables (x y z t ...) to symbolic variables that we can use as parameters.

Now, we can relate the variables. As an example:
\[ Z=x+y^2 \]

Try it yourself!
Now, if we want to validate this equation for known values for $x$ and $y$ we can type down the following command:

```
subs(z,{x,y},{1 2})
```

It is equivalent to: $z = x + y^2 = 1 + 2^2 = 5$

Also, to integrate and differentiate symbolic statements we can use `int` and `diff` commands respectively.

Example 1:

```
Int(z,y)
```

Try it yourself!

Example 2:

```
diff(z,y)
```

Try it yourself!

### D. 3D Plotting

In this part we will discuss two different functions for plotting data in a three dimensional environment.

#### D.1 plot 3(x,y,z)

This command plots $x$, $y$ and $z$ in a 3D environment. Please note that $x$, $y$ and $z$ should be vectors with same lengths.

Example:

```
x=0:0.01:6*pi;

y=sin(x);
```
\[ z = \cos(x); \]
\[ \text{plot3}(x, y, z) \]
\[ \text{xlabel('x')} \]
\[ \text{ylabel('y')} \]
\[ \text{zlabel('z')} \]

**D.2 Mesh(x,y,z)**

This command plots one point for each of the \( x(i) \) and \( y(j) \) point with the \( z \) axis value equal to \( z(i,j) \).

Example:

Please open the example.m file (it is an m-file) in the m-file editor of MATLAB.