

① start up Matlab and try the upcoming short "exercises"

2 exercises 1a, 1b, 1c + "flow diagram"

2) exercises from "book"

"prompt"

"leave" Matlab :

>> exit (2)

Or

>> quit(2)

"enter"

help function :

>> help, ----- (2)

space

keyword

basic operations: +

1

*

—

τ_{power}

check later--

○ / , ● * , ○ ^
 ↖ ↗ →
 "important"

(component wise operation)

Save your "history" :

>> diary, filename

↑
choose

$$\left. \begin{array}{l} \gg \\ \cdot \end{array} \right\} \text{operations}$$

>> diary, off

→ file with
name: "filename"

② other operations: $\sin(--)$, $\cos(--)$, $\text{atan}(--)$, $\log(--)$
 $\text{sqrt}(--)$, etcetera which log?

Try:

$$\rightarrow 2^2 + \ln(\pi) \sin(4)$$

$$\rightarrow \sqrt{cd - \cos(e^3)}$$

$$\text{with } c = 3.024 \times 10^4$$

$$d = \tanh(\cosh^2(10^{-2}))$$

$$e = \arctan(1)$$

$$\rightarrow \frac{2^5 - 2^3}{3^4 - \sqrt{3}}$$

$$\rightarrow \sin^2\left(\frac{\pi}{4}\right) + \cos^2\left(\frac{\pi}{4}\right)$$

what is NaN? What is Inf? What is eps?

what does ; do at the end of a command line?
↳ "important" !!!

what is format, long?

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For loop

example: "Fibonacci" $\begin{cases} a_0 = 1 \\ a_1 = -2 \\ a_{n+1} = a_n + a_{n-1} \end{cases} \quad n = 1, 2, \dots$

```

>> a0 = 1 ; ?!
>> a1 = -2 ; ?!
>> for n = 2 : 100 (2)
    a = a0 + a1 ; (2)
    a0 = a1 ; (2)
    a1 = a ; (2)
end (2)

```

Final index

OR

Matlab does not have index = 0 !

```

>> a(1) = 1 (2)
>> a(2) = -2 (2)
>> for n = 2 : 100 (2)
    a(n+1) = a(n) + a(n-1) (2)
end (2)

```

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while loop

example:

"Determine the largest value of n in $1^2 + 2^2 + \dots + n^2$ such that the sum is less than 100"

```
>> S=1 ; n=1; (2) ← "initialize"  
>> while S + (n+1)^2 < 100 (2)  
      n = n+1 ; S = S + n^2 ; (2)  
      end      (2)  
>> n
```

if -- elseif -- else -- end

example: "check : is $\pi^e > e^\pi$ or $< e^\pi$?"

```
>> a = pi^exp(1) ; c = exp(pi) ; (2)  
>> if a >= c (2)  
      b = sqrt(a^2 - c^2) (2)  
    else (2)  
      b = 0 (2)  
    end (2)
```

(b always will have a value)

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In general:

```
if logical test 1
    execute commands if test 1 is true
elseif
    execute commands if test 2 is true
elseif
    -----
else
    execute in all other situations/cases
end
```

" == " (equal to)

" != " (not equal to)

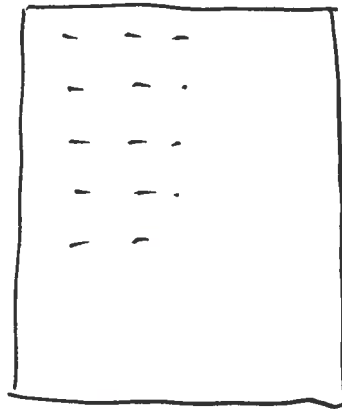
> , < , >= , <=

← types of logical test

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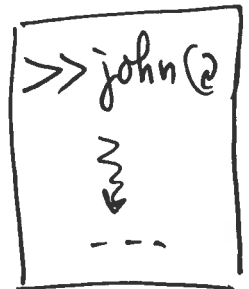
Script files

example: file: `john.m` ← { create and change in text-editor



executes all lines in this order

in Matlab:
(check folder!)



function files

"==" script-file with extra option
for one (or more) input parameters
and one (or more) output parameters

example: "calculate the average of an array of numbers"
(`z = [1; 2; 3; 4; 5; 6; 7; 8; 9;]`)

in text-editor:

```
function y = aver(x)
% your text
m = length(x);
y = sum(x)/m;
```

filename: `aver.m`

in Matlab:
(check folder again!)

can be done more efficiently of course

```
>> z = ... (2)
>> answer = aver(z); (2)
>> help, aver (2)
=> your text
```

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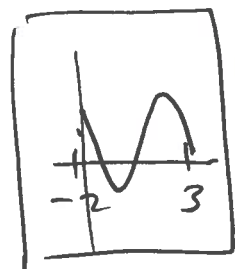
graphs/plots

example: { interval $[-2, 3]$
steps 0.01
graph of $\sin(x)$

```
>> x = -2.0:0.01:3.0; (2)
```

```
>> y = sin(x); (2)
```

```
>> plot(x, y) (2)
```



OR x^4 :

```
>> y = x^4; (2)
```

 → error message!

```
>> y = x.^4; (2)
```


etcetera

```
>> clf (2)
```

 keeps figure window, but clears the plot

```
>> close (2)
```

 deletes the figure window as well

```
>> clear, all (2)
```

 "deletes all variables"

check

title
xlabel
ylabel
axis
subplot

} use
"help"

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2d surfaces in 3d

example : $\begin{cases} \text{domain } 2 \leq x \leq 4, 1 \leq y \leq 3 \\ \text{steps } 0.2 \text{ (in both directions)} \\ z = (x-3)^2 - (y-2)^2 \end{cases}$

>> $[x,y] = \text{meshgrid}(2.0:0.2:4.0, 1.0:0.2:3.0)$;
(creates a "grid" in 2 dimensions) ↑

>> $z = (x-3) \cdot 12 - (y-2) \cdot 12$;
↑ ↑ ↑

>> $\text{mesh}(x,y,z)$ (or: $\text{surf}(x,y,z)$)
== ↑! == ↑!

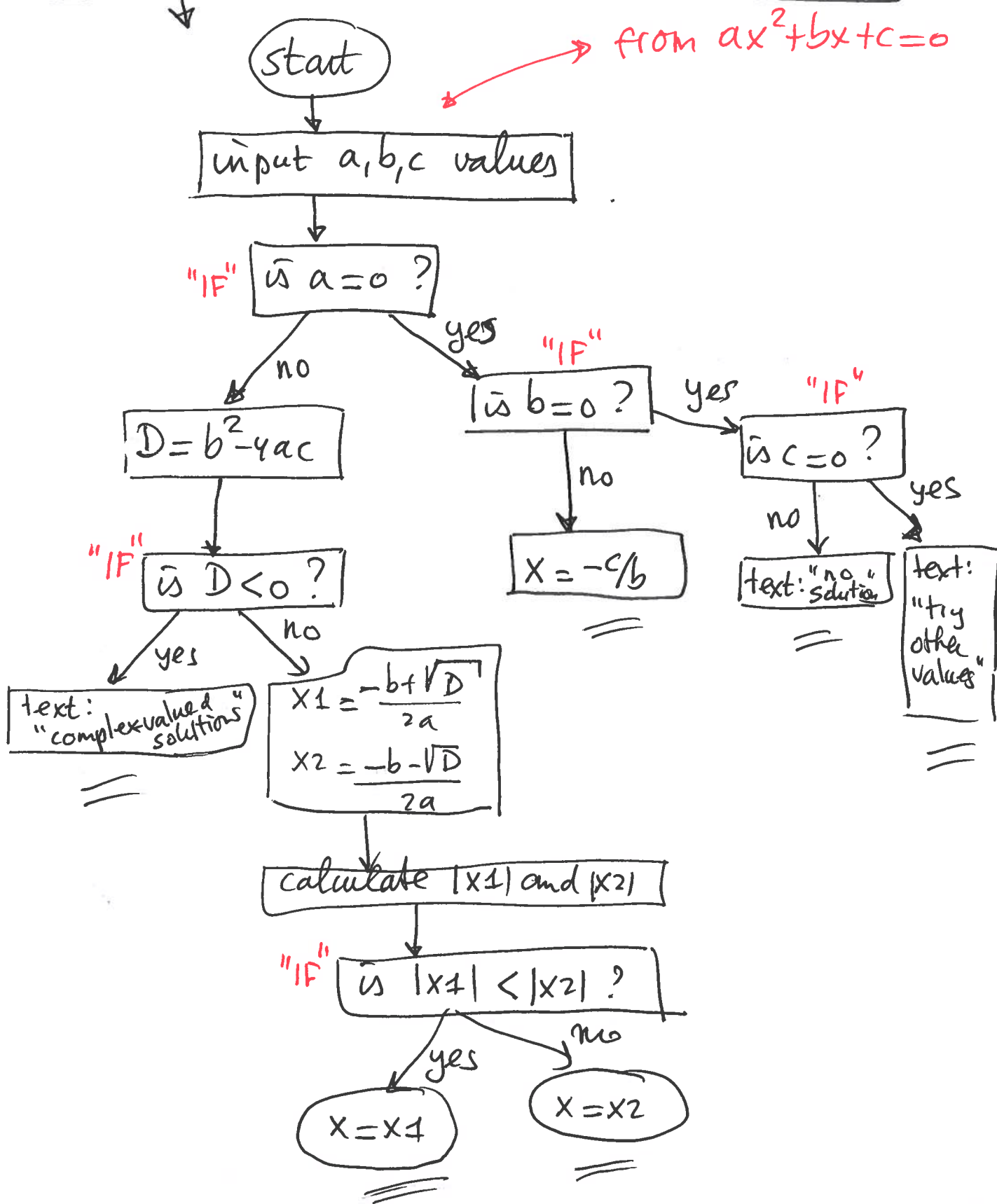
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"flow diagram"

for 1a

(stream diagram)

file: wortel.m (in text-editor)



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"flow diagram"

for 15

$T = -\tanh(\text{arg})$
 $\text{arg} = \dots$
 etcetera

! in Matlab:

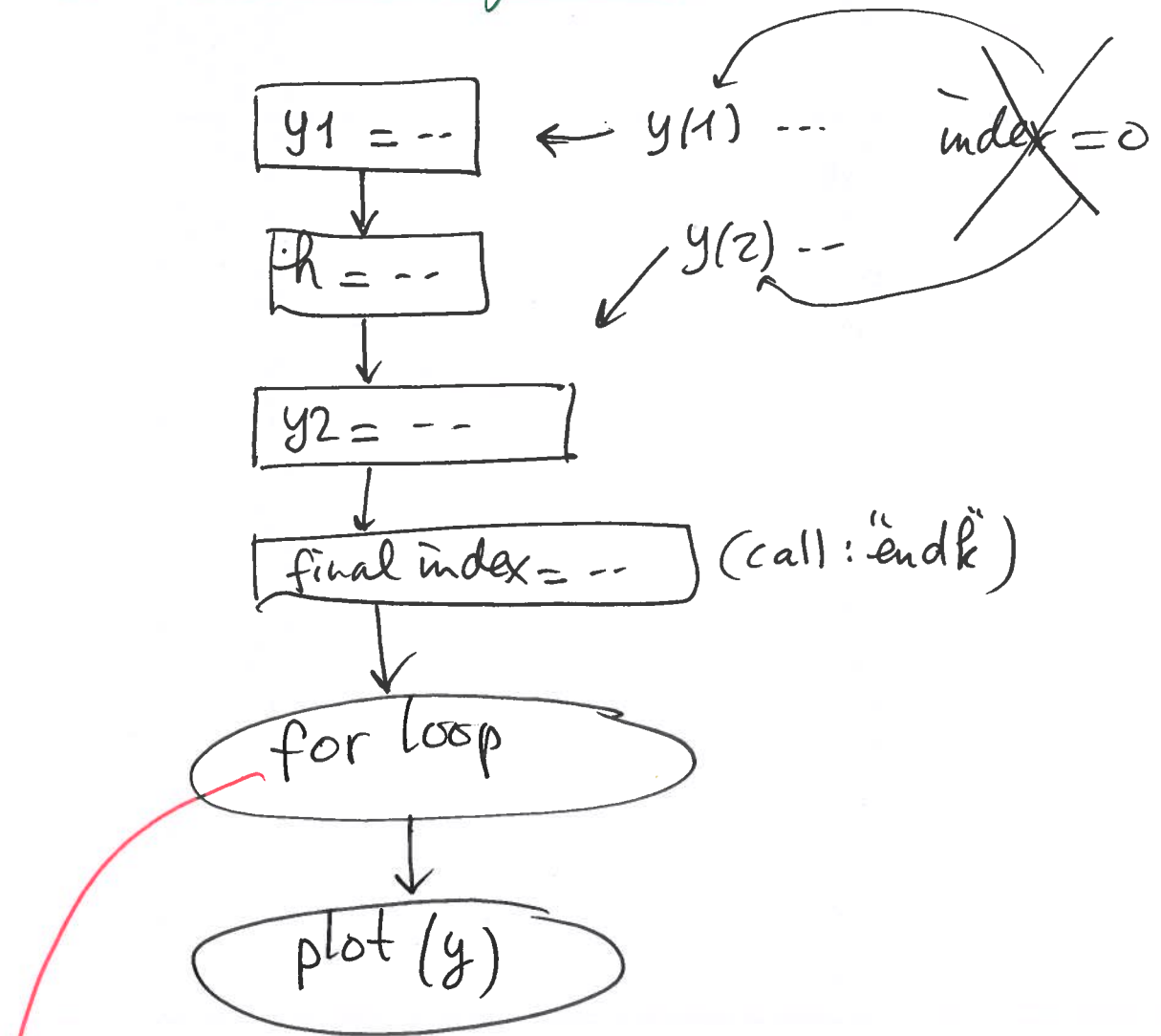
① check the correct order of formulas!

② check $\cdot$, $*$, $/$ and $\wedge$!!!
(almost everywhere $\dots$?)

③ function file with input t
and "output": surface plot!
(no numbers)

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"flow diagram" for 1c



→ check extra file on webpage
for different scenarios!
(substitute/re-arrange/----)