Matlab as a fancy calculator

Eugeniy E. Mikhailov

The College of William & Mary

Lecture 02
Matlab variable types

- Integer: 123, -345, 0
- Real or float: 12.2344, 5.445454
- Engineering notation: $4.2323 \times 10^{-9}$
- Complex: $i = \sqrt{-1} = 1i$
  
  $34.23 + 21.21i$ 
  $(1+1i) \times (1-1i) = 2$
- Strings: 
  - Put your words inside apostrophes
  - Handy for file names and messages
  - e.g. 'programming is fun'
  - s = 'Williamsburg'
Matlab variable types

- integer
  - 123, -345, 0

- real or float
  - 12.2344
  - 5.445454

- engineering notation
  - 4.2323e-9 = 4.2323 × 10^{-9}

- complex
  - \( i = \sqrt{-1} = 1i \)
  - 34.23 + 21.21i
  - \((1 + 1i) \times (1 - 1i) = 2\)

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Some built in constants and functions

- $\pi = 3.141592653589793238462643383279502 \cdots$
  - use `pi`

- trigonometry functions
  - `sin`, `cos`, `tan`, `cot`
  - `asin`, `acos`, `atan`, `acot`

- hyperbolic functions
  - `sinh`, `cosh`, `tanh`, `coth`
  - `asinh`, `acosh`, `atanh`, `acoth`

- logarithms
  - natural `log`
  - base of 10 `log10`

- power
  - $x^y$ use `x^y` or alternatively `power(x, y)`
  - $e^y$ use `exp(y)`
Assignment operator

\[ x = 1.2 + 3.4 \]

\[ x \] is not an equality operator. \( = \) is an assignment operator. The expression above should be read as evaluate expression at the right hand side of equality symbol assign the result of the RHS to the variable on the left hand sign now variable \( x \) holds the value 4.6 We are free to use the value of the variable \( x \) in any further expressions

\[ x + 4.2 \]

\[ \text{ans} = 8.8 \]
Assignment operator

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The expression above should be read as
- evaluate expression at the right hand side of equality symbol
- assign the result of the RHS to the variable on the left hand sign
- now variable \( x \) holds the value \( 4.6 \)

We are free to use the value of the variable \( x \) in any further expressions.

\[ > x + 4.2 \]
\[ \text{ans} = 8.8 \]
Once you typed some expressions in “Command window”

- type couple of first symbols of variable or function name
- hit tab and you will get
  - either fully typed name (if it is uniq)
  - or little chart with choices
    - use <up> or <down> arrows to choose
    - alternatively <Ctrl-p>, <Ctrl-n>
    - then hit <enter> to make your choice
Help related commands

These are the most important commands

- **docsearch word**
  - will search for *word* in the help files and show up matched help files
  - example: `docsearch trigonometry`

- **help name**
  - output short help text into “Command window” about function/method named *name*
  - example: `help sin`

- **doc name**
  - show a reference page about function/method named *name* in the help vrowser
  - usually has more information compare to `help name`
  - example: `doc sin`
Look at the following Matlab expression

\[-2^4 \times 5 + \tan(\pi/8 + \pi/8)^2\]

Guess the answer.
Look at the following Matlab expression

\[-2^4 \times 5 + \tan(\pi/8 + \pi/8)^2\]

Guess the answer.

\[-(2^4) \times 5 + (\tan(\pi/8 + \pi/8))^2\]
Operator Precedence

Look at the following Matlab expression

$$-2^4 \times 5 + \tan(\pi/8+\pi/8)^2$$

Guess the answer.

$$-(2^4) \times 5 + \left(\tan\left(\frac{\pi}{8}+\frac{\pi}{8}\right)\right)^2$$

$$-(16) \times 5 + \left(\tan\left(\frac{\pi}{4}\right)\right)^2$$

Rule of thumb: if not sure use extra parentheses ()

Read more by executing `doc precedence` or searching for 'precedence' in the help browser.
Operator Precedence

Look at the following Matlab expression

\[-2^4 \times 5 + \tan(\pi/8 + \pi/8)^2\]

Guess the answer.

\[-(2^4) \times 5 + (\tan( (\pi/8 + \pi/8) ))^2\]

\[-(16) \times 5 + (\tan( (\pi/4) ))^2\]

\[-80 + (1)^2\]
Operator Precedence

Look at the following Matlab expression

\[-2^4*5 + \tan(\pi/8+\pi/8)^2\]

Guess the answer.

\[-(2^4)*5 + (\tan(\ (\pi/8+\pi/8) \ )))^2\]

\[-(16)*5 + (\tan(\ (\pi/4) \ )))^2\]

\[-80 + (1)^2 = -80 + 1\]
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Look at the following Matlab expression

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\[-80 + (1)^2 = -80 + 1 = -79\]
Operator Precedence

Look at the following Matlab expression

\[-2^4*5 + \tan(pi/8+pi/8)^2\]

Guess the answer.

\[- (2^4)*5 + (\tan((pi/8+pi/8)))^2\]

\[-(16)*5 + (\tan((pi/4)))^2\]

\[-80 + (1)^2 = -80 + 1 = -79\]

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