MAT 1206 – Introduction to MATLAB

CHAPTER 02: Fundamental Operators and Commands

Lesson 1

Content

- Basic Syntax
- MATLAB as a Calculator

Basic Syntax

- Clear the command window: clc
- Clear the workspace: clear
- Remove unnecessary vertical double spaces in the command window:

  format compact

  format default/loose
- Precision of values:

  format long

  format short (default)

Cont.

- Tab completion: Use tab key for completing function/variables
- Stop MATLAB execution:

  rand(1e8, 1)

  ctrl + c

- ‘ans’ is the variable created when an output is returned without a specified output argument.

  Type 5 + 5 and press Enter: ans = 1

Cont.

- Use of Semicolon (;)

  Semicolon (;) indicates end of statement.

  However, if you want to suppress and hide the MATLAB output for an expression, add a semicolon after the expression.

- Add Comments to Code:

  Comments allow others to understand your code and can refresh your memory when you return to it later.

  During code development and testing, you also can use comments to comment out any code that does not need to run.

Constants

- MATLAB has several predefined constants that can be used in place of variables or values in expressions. The following is a small selection of some of the most useful ones:

pi	π
i	Imaginary number $\sqrt{-1}$.
eps	The smallest number, ϵ, determined by machine precision.
Inf	The largest number, ∞.
NaN	Not a Number. Undefined numerical result.

MATLAB as a Calculator

Operation	Symbol	Example	Maths	Output
Addition	+	`4 + 7`	$4+7$	`11`
Subtraction	−	`12.3 - 5`	$12.3-5$	`7.3000`
Multiplication	*	`0.45 * 972.503`	0.45×972.503	`437.6264`
Division	/	`5 / 98.07`	$\frac{5}{98.07}$	`0.0510`
Power	^	`4^7.1`	$4^{7.1}$	`1.8820e+004`
Square Root	`sqrt()`	`sqrt(15)`	$\sqrt{15}$	`3.8730`
Logarithm*	`log()`	`log(0.67)`	$\ln(0.67)$	`-0.4005`
Exponent	`exp()`	`exp(-2.1)`	$\exp(-2.1) = e^{-2.1}$	`0.1225`
Sine**	`sin()`	`sin(0.8)`	$\sin(0.8)$	`0.7174`
Cosine**	`cos()`	`cos(-2)`	$\cos(-2)$	`-0.4161`

* natural logarithm

** the arguments for all trigonometric functions are in radians

Exercises

- Demonstrate by using several values of angle ϑ that:

$$\sin^2(\theta) + \cos^2(\theta) = 1$$

- Verify the values of the following trigonometric table:

θ / Trigonometric ratios	0°	30°	45°	60°	90°
sinθ	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1
cosθ	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0
tanθ	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	undefined
cosecθ	undefined	2	$\sqrt{2}$	$\frac{2}{\sqrt{3}}$	1
secθ	1	$\frac{2}{\sqrt{3}}$	$\sqrt{2}$	2	undefined
cotθ	undefined	$\sqrt{3}$	1	$\frac{1}{\sqrt{3}}$	0

Cont.

- Use one MATLAB line to evaluate the expressions below:

I. $$\sqrt{\frac{(4.172 + 9.131844)^3 - 18}{-3.5 + (11.2 - 4.6) * (7 - 2.91683)^{-0.4}}}$$

II. $$\sqrt[3]{\frac{(4.23+6.325)^3-10}{2.5+(8.23-2.56)^{-0.2}e^{3.2}}}$$

(Hint: nthroot(X,N) returns the real nth root of X)

Cont.

III. $\frac{3}{19}(2.6)(4^5) + \frac{.51^3}{3^4 - 123}$

IV. $\frac{23^2}{5} + \frac{81^{3/4}}{11} + 35 \cdot 4^{-3}$

V. $5\sqrt{\frac{(2+\cos(120°))^3 - \ln(5.25)}{2.5e^{5/3} + \sin(\pi/6)}}$

Cont.

- The following list of operations can be used to convert real numbers into integers:
  - round(a) - Rounds a using the standard rounding rules.
  - ceil(a) - Returns the nearest integer greater than or equal to a.
  - floor(a) - Returns the nearest integer smaller than or equal to a.

Cont.

- Inverse trigonometric functions in MATLAB

Function	MATLAB Syntax
$\sin^{-1}\vartheta$	asin(ϑ) or asind(ϑ)
$\cos^{-1}\vartheta$	acos(ϑ) or acosd(ϑ)
$\tan^{-1}\vartheta$	atan(ϑ) or atand(ϑ)
$\mathrm{cosec}^{-1}\vartheta$	acsc(ϑ) or acscd(ϑ)
$sec^{-1}\vartheta$	asec(ϑ) or asecd(ϑ)
$\cot^{-1}\vartheta$	acot(ϑ) or acotd(ϑ)

Questions/queries?