



Al-Rasheed University College

Dept. of Computer Tech. Engineering

Second Class

Computer Applications

By

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Fifth Lecture

Expressions

4- Functions

- Some of the functions, like `sqrt` and `sin`, are *built in*. *They are part of the MATLAB core* so they are very efficient, but the computational details are not readily accessible. Other functions, like `gamma` and `sinh`, are implemented in M-files. You can see the code and even modify it if you want.

Expressions Functions

Command	Description
abs(x)	Absolute value (magnitude of complex number).
acos(x)	Inverse cosine.
angle(x)	Phase angle (angle of complex number).
asin(x)	Inverse sine.
atan(x)	Inverse tangent.
atan2(x,y)	Four quadrant inverse tangent: $\tan^{-1}(x / y)$.
ceil(x)	Round towards plus infinity.
conj(x)	Complex conjugate.
cos(x)	Cosine of x, assumes radians.
exp(x)	Exponential: e^x .
fix(x)	Round towards zero.

Expressions Functions

Command	Description
<code>imag(x)</code>	Complex imaginary part.
<code>log(x)</code>	Natural logarithm: $\ln(x)$.
<code>log10(x)</code>	Common (base 10) logarithm: $\log_{10}(x)$.
<code>log2(x)</code>	Base 2 logarithm: $\log_2(x)$.
<code>real(x)</code>	Complex real part.
<code>rem(x)</code>	Remainder after division.
<code>mod(x)</code>	Modulus after division.
<code>round(x)</code>	Round towards nearest integer.
<code>sign(x)</code>	Signum: return sign of argument.
<code>sin(x)</code>	Sine of x, assumes radians.
<code>sqrt(x)</code>	Square root.
<code>tan(x)</code>	Tangent of x, assumes radians.

Expressions

Several special functions provide values of useful constants •

Constant	Description
eps	Floating point relative accuracy $\approx 2.2204e-016$.
realmax	Largest positive floating point number.
realmin	Smallest positive floating point number.
pi	3.1415926535897....
i and j	Imaginary unit $\sqrt{-1}$.
inf	Infinity, e.g. $1/0$
NaN	Not A Number, e.g. $0/0$

Expressions

Examples of Expressions

```
>> x = (1+sqrt(5))/2
```

```
x =
```

```
1.6180
```

```
>> a = abs(3+4i)
```

```
a =
```

```
5
```

```
>> y=sin(pi/3)+cos(pi/4)-2*sqrt(3)
```

```
y =
```

```
1.8910
```

Expressions

Quizz

Write a Program to calculate the electromagnetic force between two electrons placed (in vacuum) at a distance ($r = 2 * 10^{-13}$ m) from each other. Charge of electron (Q) is $1.6 * 10^{-19}$ C.

Hint

$$\text{Electromagnetic Force} = K \frac{Q_1 Q_2}{r^2}$$

$$K = 9 * 10^9$$

Operator Precedence

- build expressions that use any combination of arithmetic, relational, and logical operators. Precedence levels determine the order in which MATLAB evaluates an expression. Within each precedence level, operators have equal precedence and are evaluated from left to right. The precedence rules for MATLAB operators are shown in next list, ordered from highest precedence level to lowest precedence level:

Operator Precedence

- 1 - Parentheses ()
- 2 - Transpose (.'), power (.^), complex conjugate transpose ('), matrix power (^)
- 3- Unary plus (+), unary minus (-), logical negation (~)
- 4 - Multiplication (.*), right division (./), left division (.\), matrix multiplication (*), matrix right division (/), matrix left division (\)
- 5 - Addition (+), subtraction (-)
- 6 - Colon operator (:)
- 7- Less than (<), less than or equal to (<=), greater than (>), greater than or equal to (>=), equal to (==), not equal to (~=)
- 8 - Element-wise AND (&)
- 9 - Element-wise OR (|)
- 10 - Short-circuit AND (&&)
- 11 - Short-circuit OR (||)

Relational Operators

Operator	Description
<	Less than
<=	Less than or equal to
>	Greater than
>=	Greater than or equal to
==	Equal to
~=	Not equal to