

Lecture one: Mathematical Functions

MATLAB offers many predefined mathematical functions for technical computing which contains a large set of mathematical functions. Typing `help elfun` and `help specfun` calls up full lists of elementary and special functions respectively. There is a long list of mathematical functions that are built into MATLAB. These functions are called built-ins. Many standard mathematical functions, such as $\sin(x)$, $\cos(x)$, $\tan(x)$, e^x , $\ln(x)$, are evaluated by the functions `sin`, `cos`, `tan`, `exp`, and `log` respectively in MATLAB.

Table 1 lists some commonly used functions, where variables x and y can be numbers, vectors, or matrices.

Table1: Elementary Functions

Matlab name	Comment
<code>cos(x)</code>	Cosine
<code>sin(x)</code>	Sine
<code>tan(x)</code>	Tangent
<code>atan(x)</code>	Arc tangent
<code>asin(x)</code>	Arc cosine
<code>acos(x)</code>	Arc sine
<code>abs(x)</code>	Absolute value
<code>sign(x)</code>	Signum function
<code>max(x)</code>	Maximum value
<code>min(x)</code>	Minimum value
<code>ceil(x)</code>	Round towards $+\infty$
<code>floor(x)</code>	Round towards $-\infty$
<code>exp(x)</code>	Exponential
<code>round(x)</code>	Round to nearest integer
<code>sqrt(x)</code>	Square root
<code>rem(x)</code>	Remainder after division
<code>log(x)</code>	Natural logarithm
<code>log10(x)</code>	Common logarithm
<code>angle(x)</code>	Phase angle
<code>conj(x)</code>	Complex conjugate

Example:

We illustrate here some typical examples which related to the elementary functions previously defined. As a first example, the value of the expression $y = e^{-a} \sin(x) + 10\sqrt{y}$, for $a = 5$, $x = 2$ and $y = 8$ are computed by:

```
>> a=5;x=2;y=8;  
A=exp(-a)*sin(x)+10*sqrt(y)  
  
A =  
  
    28.2904  
fx >> |
```

The subsequent examples are:

```
>> log(142)  
  
ans =  
  
    4.9558  
  
>> log10(142)  
  
ans =  
  
    2.1523
```

Note the difference between the natural logarithm $\log(x)$ and the decimal logarithm (base 10) $\log_{10}(x)$.

To calculate $\sin(\pi/4)$ and e^{10} , we enter the following commands in MATLAB,

```
>> sin(pi/4)
```

```
ans =
```

```
0.7071
```

```
>> exp(10)
```

```
ans =
```

```
2.2026e+004
```