Lab 01: Introduction to MATLAB and LaTeX

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1 Output

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beep off
help log
 <strong>log</strong>    Natural logarithm.
    <strong>log</strong>(X) is the natural logarithm of the elements of X.
    Complex results are produced if X is not positive.

    See also <a href="matlab:help log1p">log1p</a>, <a href="matlab:help log2">log2</a>, <a href="matlab:help log10">log10</a>, <a href="matlab:help exp">exp</a>, <a href="matlab:help logm">logm</a>, <a href="matlab:help reallog">reallog</a>.

    <a href="matlab:doc log">Reference page for log</a>
    <a href="matlab:matlab.internal.language.introspective.overloads.displayOverloads('log')">Other functions named log</a>

help sin
 <strong>sin</strong>    Sine of argument in radians.
    <strong>sin</strong>(X) is the sine of the elements of X.

    See also <a href="matlab:help asin">asin</a>, <a href="matlab:help sind">sind</a>.

    <a href="matlab:doc sin">Reference page for sin</a>
    <a href="matlab:matlab.internal.language.introspective.overloads.displayOverloads('sin')">Other functions named sin</a>

help tan
 <strong>tan</strong>    Tangent of argument in radians.
    <strong>tan</strong>(X) is the tangent of the elements of X.

    See also <a href="matlab:help atan">atan</a>, <a href="matlab:help atan2">atan2</a>, <a href="matlab:help tand">tand</a>, <a href="matlab:help atan2d">atan2d</a>.

    <a href="matlab:doc tan">Reference page for tan</a>
    <a href="matlab:matlab.internal.language.introspective.overloads.displayOverloads('tan')">Other functions named tan</a>

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2 + 5

ans =

     7

4 ^ 5

ans =

        1024

7 * 6

ans =

    42

3 / 8

ans =

    0.3750

54460 - 2342

ans =

       52118

cos(50 / 180 * pi)

ans =

    0.6428

sqrt(4)

ans =

     2

log(3)

ans =

    1.0986

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sin(pi / 2)

ans =

     1

e ^ 34
{Undefined function or variable 'e'.
}
exp(34)

ans =

   5.8346e+14

plus(2, 5)

ans =

     7

power(4, 5)

ans =

        1024

times(7, 6)

ans =

    42

rdivide(3, 8)

ans =

    0.3750

minus(54460, 2342)

ans =

       52118

help plus
 +   Plus.
    X + Y adds matrices X and Y. X and Y must have compatible sizes. In the
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    simplest cases, they can be the same size or one can be a scalar. Two
    inputs have compatible sizes if, for every dimension, the dimension
    sizes of the inputs are either the same or one of them is 1.

    C = <strong>plus</strong>(A,B) is called for the syntax 'A + B' when A or B is an
    object.

    <a href="matlab:doc plus">Reference page for plus</a>
    <a href="matlab:matlab.internal.language.introspective.overloads.displayOverloads('plus')">Other functions named plus</a>

help power
 .^  Array power.
    Z = X.^Y denotes element-by-element powers. X and Y must have
    compatible sizes. In the simplest cases, they can be the same size or
    one can be a scalar. Two inputs have compatible sizes if, for every
    dimension, the dimension sizes of the inputs are either the same or one
    of them is 1.

    C = <strong>power</strong>(A,B) is called for the syntax 'A .^ B' when A or B is an
    object.

    See also <a href="matlab:help mpower">mpower</a>, <a href="matlab:help nthroot">nthroot</a>, <a href="matlab:help realpow">realpow</a>.

    <a href="matlab:doc power">Reference page for power</a>
    <a href="matlab:matlab.internal.language.introspective.overloads.displayOverloads('power')">Other functions named power</a>

help times
 .*  Array multiply.
    X.*Y denotes element-by-element multiplication. X and Y must have
    compatible sizes. In the simplest cases, they can be the same size or
    one can be a scalar. Two inputs have compatible sizes if, for every
    dimension, the dimension sizes of the inputs are either the same or one
    of them is 1.

    C = <strong>times</strong>(A,B) is called for the syntax 'A .* B' when A or B is an
    object.

    See also <a href="matlab:help mtimes">mtimes</a>.

    <a href="matlab:doc times">Reference page for times</a>
    <a href="matlab:matlab.internal.language.introspective.overloads.displayOverloads('times')">Other functions named times</a>

help rdivide
 ./  Right array divide.
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    A./B denotes element-by-element division. X and Y must have compatible
    sizes. In the simplest cases, they can be the same size or one can be a
    scalar. Two inputs have compatible sizes if, for every dimension, the
    dimension sizes of the inputs are either the same or one of them is 1.

    C = <strong>rdivide</strong>(A,B) is called for the syntax 'A ./ B' when A or B is an
    object.

    See also <a href="matlab:help ldivide">ldivide</a>, <a href="matlab:help mldivide">mldivide</a>, <a href="matlab:help mrdivide">mrdivide</a>.

    <a href="matlab:doc rdivide">Reference page for rdivide</a>
    <a href="matlab:matlab.internal.language.introspective.overloads.displayOverloads('rdivide')">Other functions named rdivide</a>

help minus
 -   Minus.
    X - Y subtracts matrix Y from X. X and Y must have compatible sizes. In
    the simplest cases, they can be the same size or one can be a scalar.
    Two inputs have compatible sizes if, for every dimension, the dimension
    sizes of the inputs are either the same or one of them is 1.

    C = <strong>minus</strong>(A,B) is called for the syntax 'A - B' when A or B is an
    object.

    <a href="matlab:doc minus">Reference page for minus</a>
    <a href="matlab:matlab.internal.language.introspective.overloads.displayOverloads('minus')">Other functions named minus</a>

diary off
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\section{Basics of \LaTeX{}}

\subsection{Simplifying Fractions}
Consider the function
$$
f(x) = \frac{x^2 - 1}{x + 1}.
$$
To simplify this funciton we can factor the numerator and cancel like terms
\begin{align*}
    f(x)
       & = \frac{x^2 - 1}{x + 1}
    \\ & = \frac{(x - 1) (x + 1)}{x + 1}
    \\ & = x - 1.
\end{align*}

\subsection{Matrix}
A general $3 \times 3$ matrix $A$ has the form
$$
A =
\begin{bmatrix}
    1 & 2 & 3 \\
    4 & 5 & 6 \\
    7 & 8 & 9 \\
\end{bmatrix}.
$$

\subsection{The Millennium Prize Problems}
\emph{The Millennium Prize Problems} are seven problems in mathematics that were stated by
the \textbf{Clay Mathematics Institute} on May 24, 2000. The problems are
\begin{enumerate}[(1)]
  \item Birch and Swinnerton-Dyer conjecture,
  \item Hodge conjecture,
  \item Navier–Stokes existence and smoothness,
  \item P versus NP problem,
  \item Poincar\'{e} conjecture,
  \item Riemann hypothesis,
  \item Yang–Mills existence and mass gap.
\end{enumerate}
\textsc{The Riemann zeta function} is defined for complex $s$ with real part greater than $1$
by the absolutely convergent infinite series
$$
\zeta(s) = \sum_{n=1}^{\infty} \frac{1}{n^s} = \frac{1}{1^s} + \frac{1}{2^s} + \frac{1}{3^s} + \cdots
$$
The practical uses of the Riemann hypothesis include many propositions known true under the
Riemann hypothesis, and some that can be shown to be equivalent to the Riemann hypothesis:
\begin{itemize}
  \item Distribution of prime numbers,
  \item Growth of arithemtic functions,
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  \item Large prime gap conjecture,
  \item Criteria equivalent to the Riemann hypothesis.
\end{itemize}
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