\[ x = 3 \]
define variable \( x \) to be 3

\[ x = [1 \, 2 \, 3] \]
set \( x \) to the \( 1 \times 3 \) row vector \((1, 2, 3)\)

\[ x = [1; \, 2; \, 3] \]
set \( x \) to the \( 3 \times 1 \) vector \((1, 2, 3)\)

\[ A = [1 \, 2; \, 3 \, 4] \]
set \( A \) to the \( 2 \times 2 \) matrix \[
\begin{bmatrix}
1 & 2 \\
3 & 4
\end{bmatrix}
\]

\[ x(2) = 7 \]
change \( x_2 \) to 7

\[ A(2,1) = 0 \]
change \( A_{21} \) to 0

\[ 3 \times x \]
multiply each element of \( x \) by 3

\[ x + 3 \]
add 3 to each element of \( x \)

\[ x + y \]
add \( x \) and \( y \) element by element

\[ A \times x \]
product of matrix \( A \) and column vector \( x \)

\[ A \times B \]
product of two matrices \( A \) and \( B \)

\[ x \times y \]
element-wise product of vectors \( x \) and \( y \)

\[ A^3 \]
for a square matrix \( A \), raise to third power

\[ \cos(A) \]
cosine of every element of \( A \)

\[ \sin(A) \]
sine of every element of \( A \)

\[ x' \]
transpose of vector \( x \)

\[ A' \]
transpose of vector \( A \)

\[ A(2:12,4) \]
the submatrix of \( A \) consisting of the second to twelfth rows of the fourth column

\[ A(2:12,4:5) \]
the submatrix of \( A \) consisting of the second to twelfth rows of the fourth and fifth columns

\[ A(2:12,:) \]
the submatrix of \( A \) consisting of the second to twelfth rows of all columns

\[ A([1:4,6],:) \]
the submatrix of \( A \) consisting of the first to fourth rows and sixth row

\[ [A \, B; \, C \, D] \]
creates the matrix \[
\begin{bmatrix}
A & B \\
C & D
\end{bmatrix}
\] where \( A, B, C, D \) are block matrices (blocks must have compatible sizes)

\[ \text{rand}(12,4) \]
\( 12 \times 4 \) matrix with uniform random numbers in \([0, 1)\)

\[ \text{zeros}(12,4) \]
\( 12 \times 4 \) matrix of zeroes

\[ \text{ones}(12,4) \]
\( 12 \times 4 \) matrix of ones

\[ \text{eye}(12) \]
\( 12 \times 12 \) identity matrix

\[ \text{eye}(12,4) \]
\( 12 \times 4 \) matrix whose first 4 rows are the \( 4 \times 4 \) identity

\[ \text{linspace}(1.2, 4.7, 100) \]
row vector of 100 equally spaced numbers from 1.2 to 4.7

\[ \text{diag}(x) \]
matrix whose diagonal is the entries of \( x \) (other elements are zero)

\[ \text{diag}(x,n) \]
matrix whose diagonal is the entries of \( x \) on diagonal \( n \) (other elements are zero)

\[ \text{sum}(x) \]
sum of the elements of \( x \)
\( A \backslash b \) returns the solution \( x \) to \( Ax = b \)
\( A^{-1} \) returns the inverse of \( A \)
\( \text{rref}(A) \) returns the reduced row echelon form of \( A \)
\( \text{det}(A) \) returns the determinant of \( A \)
\( \text{norm}(A) \) returns the (operator) norm of \( A \)
\( \text{cond}(A) \) returns the condition number of \( A \)
\( \text{length}(A) \) returns the larger of the number of rows and number of columns of \( A \)
\( \text{norm}(x) \) returns the norm (length) of a vector \( x \)
\( \text{vander}(x) \) returns the Vandermonde matrix for the points of \( x \)
\( \text{polyval}(a,x) \) returns the values of the polynomial \( a_1 x^{n-1} + a_2 x^{n-2} + \ldots + a_n \) at the points of \( x \)
\( [Q R] = \text{qr}(A,0) \) returns the matrices \( Q \) and \( R \) in the \( QR \) factorization of \( A \)
\( \text{nextpow2}(N) \) calculates the next power of 2 of \( N \)
\( \text{fft}(f,N) \) FFT transform of the vector \( f \) using \( N \) points (pads \( f \) with zeros if it has fewer than \( N \) elements)
\( \text{polyval}(A) \) returns the coefficients of the characteristic polynomial of \( A \)
\( \text{roots}(a) \) returns the solutions to \( a_1 x^{n-1} + a_2 x^{n-2} + \ldots + a_n = 0 \)
\( [V D] = \text{eig}(A) \) returns the matrix \( V \) whose columns are normalized eigenvectors of \( A \) and the diagonal matrix \( D \) of corresponding eigenvalues
\( \text{plot}(x,y,'bo') \) plots the points of \( y \) against the points of \( x \) using blue dots
\( \text{plot}(x,y,'r-') \) plots the points of \( y \) against the points of \( x \) using red lines
\( \text{semilogy}(x,y,'bo') \) plots \( y \) against \( x \) using a logarithmic scale for \( y \)
\( \text{axis}([-0.1 1.1 -3 5]) \) changes the axes of the plot to be from \(-0.1\) to \(1.1\) for the \( x \)-axis and \(-3\) to \(5\) for the \( y \)-axis
\( \text{hold on} \) puts any new plots on top of the existing plot
\( \text{hold off} \) any new plot commands replace the existing plot (this is the default)
\( \text{plot3}(x,y,z,'bo') \) plots the points of \( z \) against the points of \( x \) and \( y \) using blue dots
\( \text{for} \ k = 1:10 \ldots \text{end} \) for loop taking \( k \) from \( 1 \) to \( 10 \) and performing the commands \ldots for each