Matrices in MATLAB

**matrix entries**

\[
A = \begin{bmatrix} a & b & c \\ d & e & f \\ g & h & i \\ j & k & l \end{bmatrix} \quad \text{(A becomes 4 by 3 matrix)}
\]

`size(A)`

`A(i,j)` (where `i,j` are indices: gives scalar)

`j : k` (gives index (row) vector with consecutive entries)

`A(I,J)` (where `I, J` are index vectors: gives submatrix)

`[ A B C ]` (concatenates horizontally)

`[ A ; B ; C ]` (concatenates vertically)

`diag(x)` (takes vector `x` to diagonal matrix)

`diag(A)` (takes matrix `A` to column vector formed from diagonal)

**vector space operations**

\[
A + B \\
A - B \\
s * A
\]

`zeros(m,n)`

**matrix multiplication**

\[
A * B \\
A \hat{\times} n
\]

`inv(A)`

`eye(n)`

`det(A)`

`trace(A)`

**reduced row echelon form and null space**

`rank(A)`

\[
R = \text{rref}(A) \quad \text{(R becomes reduced row echelon form of A)}
\]

\[
U = \text{rref}([A \text{ eye(m)}])
\]

\[
J = n+1 : n+m
\]

\[
E = U(:, J) \quad \text{(E becomes matrix with } E A = R)
\]

\[
N = \text{null}(A, 'r') \quad \text{(N becomes rational basis for null space, } AN = 0)
\]

**eigenvalues and eigenvectors**

\[
[P, D] = \text{eig}(A) \quad \text{(P and D become matrices with } AP = PD, \text{ where D is diagonal)}
\]

**transpose**

\[A'\]