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| --- | --- | --- | --- | --- | --- |
| []: matrix ; denotes new col | | matrix, [1 2 3; 4 5 6] | | |  |
| (+,-,/,\*,^) | | can assign to var | | | a = 3^2 |
| 4d.p | | format || format short | | | 3.1416 |
| 15d.p | | format long | | | 3.141592653589793 |
| fraction (approximate if not exact) | | format rat | | | 355/113 |
| combine matrix A and b  rref | | [A b]  rref([A b]) | | |  |
| extract i row A(i,:)  ERO: i row \* constant  interchange i and j row  i row + j row \* constant | | A(4,:)  A(i,:) = c\*A(i,:)  A([i,j],:) = A([j,i],:)  A(i,:) = A(i,:) + c\*A(j,:) | | | 4 5 6 7 8 |
| get size of matrix  get ai,j  get i row  get j col  get submatrix of 2,3 row & 3,4,5 col  zero matrix  identity matrix  diagonal matrix  matrix multiplication  transpose  powers  inverse  determinant  setting free parameters | | size(A)  A(i,j)  A(i,:)  A(:,j)  B([2,3],[3,4,5])  zeros(m): square matrix || zeros(m,n)  eye(3)  diag([2 3 4 6]) (only input diagonal entries)  A\*B (only if A and B sizes match)  A'  A^n (if n is square matrix)  A^(-n) (if A is invertible)  A^(-1) || inv(A)  det(A)  syms s t (s and t are free parameters) | | | 2 3  check if soln is correct, A\*x |
| combine multiple vectors | | A = [u1 u2 u3 u4]  rref([A v1 v2 v3]) | | |  |
| dimension of A | | rank(A) | | |  |
| consistent sys | basis for soln space  particular soln if A is square and invertible  particular soln (won't work if A is square and singular) | | | | null(A, 'r')  inv(A)\*b  A\b OR linsolve(A,b) |
| inconsistent | | least square soln (same restriction as above) | | | A\b OR linsolve(A,b) |
| dot product of u and v  norm/length of v | | u \* v' OR u \* v depending on row or col form  norm(v) | | dot(u, v) regardless of row/col form  v = sym([v]); norm(v) for exact val | |
| check if set S is orthogonal/orthonormal set | | input vectors in S in row form = C  C\*C' | | diagonal matrix orthogonal set  identity matrix orthonormal set | |
| If V = span(S), to get orthonomal basis for V | | input vectors in S in col form = E  orth(E)  orth(E, 'skipnormalization') | OR E = sym([E]); orth(E) #to get exact vals  to get orthogonal basis | | |
| least squares soln if Ax = b is inconsistent, ATAx = ATb  V = span(col(A))  Projection of b onto col space of A: Ax0 = b  projection P of b onto V | | rref[A'\*A A'\*b]  col space of A = V (input vectors in col form into A)  x0 is least sq soln found in rref above  P = A\*x0 | | | get general soln from rref  Just take any x0 (sub in any vals) |
| coeff of characteristic polynomial  characteristic polynomial  eigenvalues  eigenvectors  diagonalization | | charpoly(A)  syms x; charpoly(A, x)  eig(A)  Vi = null(\*eye(n) - A, 'r')  A1 = sym(A); [P1, D1] = eig(A1) | | OR syms x; solve(charpoly(A, x))  # each col represent eigenvectors  OR P = [V1 V2 ... Vn]; inv(P)\*A\*p | |
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