18.085 Computational Science and Engineering I
Fall 2008

MATLAB's backslash command to solve $Ax = b$

★ `x=A\b` for dense `A` performs these steps (stopping when successful):

1. If `A` is upper or lower triangular, solve by back/forward substitution

2. If `A` is permutation of triangular matrix, solve by permuted back substitution (useful for `[L,U]=lu(A)` since `L` is permuted)

3. If `A` is symmetric/hermitian

   - Check if all diagonal elements are positive
   - Try Cholesky, if successful solve by back substitutions

4. If `A` is Hessenberg (upper triangular plus one subdiagonal), reduce to upper triangular then solve by back substitution

5. If `A` is square, factorize $PA = LU$ and solve by back substitutions

6. If `A` is not square, run Householder QR, solve least squares problem

Mathworks documentation:
`http://www.mathworks.com/access/helpdesk/help/techdoc/ref/mldivide.html#1002049`