

Math128B
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Homework 3 Solutions (#1-#4)

file	function
Hmwk3Main.m	receives matrix A, row vector x0, tolerance tol, and row vector b as input
PowerMethod.m	implements Power Method
JacobiMethod.m	implements Jacobi Method
GaussSeidel.m	implements Gauss Seidel Method
SORMethod.m	implements SOR (Relaxation) Method
DisplayPerf.m	implements monitoring and formatted display of performance statistics

The input matrix \mathbf{A} , vector \mathbf{b} and tolerance are taken from page 477 of Burden & Faires for comparison.
A diary of the output follows:

```

A =

    2    1    1
    1    2    1
    1    1    2

x0 =

    1   -1    2

tol =

    0.0100

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
Hmwk3Main(A,x0, tol, b)
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
Power Method %%%%%%%%%

dominant eigenvalue for Power Method =  3.9942
corresponding dominant eigenvector = [0.57742      0.577      0.57763]

error in computed eigenvalue (vs. Matlab) -0.005848

error in computed eigenvector (vs. Matlab) 0.00035245

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
A =

    0.2000    0.1000    1.0000    1.0000         0
    0.1000    4.0000   -1.0000    1.0000   -1.0000
    1.0000   -1.0000   60.0000         0   -2.0000
    1.0000    1.0000         0    8.0000    4.0000
         0   -1.0000   -2.0000    4.0000   700.0000

b =

    1    2    3    4    5

```

x0 =

1 0 0 0 0

tol =

0.0100

%%%

Hmwk3Main(A,x0, tol, b)

%%%
 %%%%%%%%%%%%%% Jacobi Method %%%%%%%%%%%%%%

Number of iterations = 48

Error in computed solution (vs. Matlab): 0.0054961

	[7.8542	0.42265	-0.073633	-0.54102	0.010621]
vs.	[7.8597	0.42293	-0.073592	-0.54064	0.010626]

Error in residual: 0.0088371

%%%
 %%%%%%%%%%%%%% Gauss-Seidel %%%%%%%%%%%%%%

Number of iterations = 15

Error in computed solution (vs. Matlab): 0.024456

	[7.8353	0.42258	-0.073191	-0.53753	0.010609]
vs.	[7.8597	0.42293	-0.073592	-0.54064	0.010626]

Error in residual: 0.0014124

%%%
 %%%%%%%%%%%%%% SOR Method (1.25) %%%%%%%%%%%%%%

Number of iterations = 8

Error in computed solution (vs. Matlab): 0.0069445

	[7.8528	0.42279	-0.073499	-0.53991	0.010623]
vs.	[7.8597	0.42293	-0.073592	-0.54064	0.010626]

Error in residual: 0.0012641

%%%
 %%%%%%%%%%%%%% SOR Method (0.75) %%%%%%%%%%%%%%

Number of iterations = 24

Error in computed solution (vs. Matlab): 0.044207

	[7.8155	0.42239	-0.07281	-0.5346	0.010591]
vs.	[7.8597	0.42293	-0.073592	-0.54064	0.010626]

Error in residual: 0.0034624

Example of graphical output:

