Instruction for test file

For testing our linear solver, we wrote a test function which can check the consistency between the result from our solvers and that from the numpy.linalg.solve( ) function.

From the txt file including several linear systems $A\boldsymbol{x} = \boldsymbol{b}$, the test function read in the linear systems which have been solved by numpy solver. Every linear systems should be separated by a line break. And in each linear system, the data should be stored in the specific format. For a $n \times n$ LHS matrix A, the whole system is stored in $(n+3)$ lines in the txt file. The first line should be the number of rows and number of cols, separated by a space. The data of LHS matrix A is stored from the second line to the $(n+1)$th line, corresponding to each line of the A from top to bottom, while the data of RHS vector $\boldsymbol{b}$ and vector $\boldsymbol{x}$ is stored in the $(n+2)$th and $(n+3)$th line separately and every elements should be separated by a space.

For example, a 4×4 linear system: $A\boldsymbol{x} = \boldsymbol{b}$

$$
\begin{pmatrix} 9929 & 924 & 948 & 537 \\ 924 & 9543 & 94 & 270 \\ 948 & 94 & 9975 & 120 \\ 537 & 270 & 120 & 9867 \end{pmatrix} \begin{pmatrix} x1 \\ x2 \\ x3 \\ x4 \end{pmatrix} = \begin{pmatrix} 329 \\ 570 \\ 883 \\ 613 \end{pmatrix}
$$

Here, we need to get the exact value of vector $\boldsymbol{x}$ by numpy.linalg.solve( ) in advance, because for testing reasons, we want to check whether or not the result we obtain by our solvers are consistent with we get from numpy solver.

In this case, vector $\boldsymbol{x}$ is:

$$
x = \begin{pmatrix} 0.02877076 \\ 0.05368908 \\ 0.09264927 \\ 0.06115476 \end{pmatrix}
$$

Above linear system in the txt file to be tested by our test function should in the format as follows:

4	4		
9929	924	948	537
924	9543	94	270
948	94	9975	120
537	270	120	9867
329	570	883	613
0.02877076	0.05368908	0.09264927	0.06115476

After reading in the data, we can call different solvers to solve all of the linear systems in the file in a row and compare the results with numpy solver. When the difference of two results is smaller than a certain accuracy which we can set manually, the test function will print "*Correct*", otherwise, it will print "*Wrong*".