Building MatLib

MatLib is class library for mostly two-dimensional matrices. This will be a static class which means that we will not be creating instances of the class but rather calling the functions and methods in the class as needed. This is equivalent to the Math class provided as part of Java.

Before beginning work on the MatLib class, you should write a separate program that will be used to test the methods and functions you will be creating. Something similar to the program MatLibTester shown here will do.

```java
import java.io.*;
import java.util.Scanner;
public class MatLibTester {
  public static void main(String[] args) throws FileNotFoundException {
    double[][] mymat;
    Scanner in = new Scanner(System.in);
    System.out.print("Enter filename of matrix... ");
    String fname = in.nextLine();
    mymat = readMat(fname);
    showMat(mymat);
  }

  public static double[][] readMat(String fname) throws FileNotFoundException {
    FileReader myreader = new FileReader(fname);
    Scanner myscanner = new Scanner(myreader);
    int nrows = myscanner.nextInt();
    int ncols = myscanner.nextInt();
    double[][] mat = new double[nrows][ncols];
    for (int r = 0; r < nrows; r++)
      for (int c = 0; c < ncols; c++)
        mat[r][c] = myscanner.nextDouble();
    myscanner.close();
    return mat;
  }

  public static void showMat(double[][] mat) {
    System.out.println();
    for (int r = 0; r < mat.length; r++)
      for (int c = 0; c < mat[0].length; c++)
        System.out.print(mat[r][c] + "	");
    System.out.println();
  }
}
```

What is provided is a way to read a two-dimensional array from a text file and to display it in standard out. As you build MatLib function you should include simple testing code in this program.
Include methods and functions in MatLib to perform the operations listed below:

\[ \text{minInRow}(\text{mat}, \text{rnum}) \] - returns the minimum value in the indicated row of mat

\[ \text{minRowIndex}(\text{mat}, \text{rnum}) \] - returns the column index of the minimum value in the row

\[ \text{minInMat}(\text{mat}) \] - returns the minimum value in mat

\[ \text{isSymmetric}(\text{mat}) \] - returns true if mat is a symmetric matrix (i.e. mat[i][j] = mat[j][i] for all i,j) Note: Be sure to verify that mat is a square matrix.

\[ \text{transpose}(\text{mat}) \] - returns the matrix that is the transpose of mat. (can be rectangular).

\[ \text{sumMat}(\text{mat}) \] - returns the sum of the elements of mat

Write MatLib and its associated testing program, create sample data to evaluate your MatLib methods and submit a report that shows the results of your tests and your source code.