1. In this homework you implement a basic recursive spectral bisection partitioning in matlab. Two-way bisection partitioning was demonstrated in class and the matlab diaries are available online from the class web-site. You will need to implement a recursive version of this technique which will keep partitioning the largest available partition at a given step, until a desired number of parts is reached. The interface to the function must be:

```
function [Sets, labl] = RSB(A, maxsets) .
```

On input, A is a graph Laplacean, and maxsets is the desired number of partitions. On return, Sets is a cell array with Sets{i} containing the list of nodes (indices) of partition i, and labl is an array of length \( n \) containing the labels (partition number) of the nodes. (The information provided by labl is redundant but it is returned because it will be available from the script RSB).

The algorithm starts with a Laplacean \( A \) and a list of all the nodes in some array, e.g., list = [1:n]. The goal is to build an array of cells called Sets that will contain the partitions. Initially we have one set, so Sets{1} = list. At any given step we are partitioning a set, whose number is, say, oldset in two subsets. Initially, oldset=1. A matrix \( B \) is associated with the current list, starting with \( B = A \). We compute the lowest 2 eigenvalues of \( B \) (using eigs), and get the Fiedler vector \( v \). We partition list into two sets listp and listm according to the sign of \( v - \text{median}(v) \). Thus, two sets are created. One of these sets is new, and is added to Sets: Sets{newset}=listm. The other one will just replace the current set that is being partitioned in two: Sets{oldset} = listm.
The process is illustrated in the above Figure where are already 4 partitions and the algorithm is in the process of partitioning set $\text{oldset}=2$. Note that at each step one partition is created and another one replaced.

You will be given a data set containing a finite element mesh to partition. In the matlab web-page you will find scripts for reading the mesh and for plotting it ($\text{mygplot}$) and a couple of other utilities.

For this homework I will ask that you upload the following on Canvas:

(a) Your script $\text{RSB}$

(b) along with your main driver,

(c) ... and any comments you may have [optional]

I will download your driver and $\text{RSB}$ script and execute them - so make sure there is nothing missing. It is important to supply only those 2 files mentioned above and to not make any changes to the other ones provided to you.