Homework - 1

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Question 1.

a. For n = 4000, the file sizes were as follows:

```
$ du -sh *.out
320M    array_004000_asc.out
123M    array_004000_bin.out
```

b. Size of the array = $4000 * 4000 * 8$ bytes
$= 128 * 10^6/(1024^2) \approx 122.07\ MB$

It can be seen that the size in memory is lesser than the size of the files. This is because storing in a file introduces overhead.

Binary format introduces a minimal overhead while ascii format is very inefficient because it involves storing numeric values as text.

For large data, binary format is the best suited.

Question 2.

The code computes the multiplication of the matrix with the vector (i.e., Ax) and checks if the resultant is a multiple of the vector (i.e., λx).

Here are the results:

vec_000003_000001.in : Yes : -6.000000
vec_000003_000002.in : Yes : -6.000000
vec_000003_000003.in : Yes : -1.000000
vec_000003_000004.in : Not an eigenvector

vec_000005_000001.in : Yes : 0.268098

vec_000005_000002.in : Not an eigenvector
vec_000005_000003.in : Yes : 0.986875
vec_000005_000004.in : Yes : 1.399039

vec_000050_000001.in : Not an eigenvector
vec_000050_000002.in : Yes : 0.479628
vec_000050_000003.in : Yes : 1.337887
vec_000050_000004.in : Not an eigenvector

vec_000080_000001.in : Yes : 0.333018
vec_000080_000002.in : Yes : 0.493142
vec_000080_000003.in : Yes : 0.939275
vec_000080_000004.in : Not an eigenvector