ME5470 INTRO TO PARALLEL SCIENTIFIC COMPUTING
HOMEWORK -1

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Q1.

```
me22btech11023@edison9:~/ME5470_Assignments/hw1-shriram2096$du -sh array_004000_bin.out
123M    array_004000_bin.out
me22btech11023@edison9:~/ME5470_Assignments/hw1-shriram2096$du -sh array_004000_asc.out
320M    array_004000_asc.out
```

As we can see from the above image, the sizes of the output files in MB are:
Array_004000_bin.out : 123MB
Array_004000_asc.out : 320MB

Size in Memory

1 double value occupies **8 bytes**
The size of the array in memory can be found out by the formula : 8 x n^2 Bytes where n x n is the size of the matrix

Here, n = 4000 so size in memory = 8 * 4000 * 4000 = 128000000 B = **128 MB**

Comparing the size in memory vs size on disk, we can observe that the size in memory is fixed (=8*n^2) but the size on disk varies on the output encoding

Q2.
The input files are kept under the subdirectory “inputfiles” and my code is in the main directory

a. n = 3

```
me22btech11023@edison9:~/ME5470_Assignments/hw1-shriram2096$gcc -std=c99 HW1_Q2.c
me22btech11023@edison9:~/ME5470_Assignments/hw1-shriram2096$./a.out
Processing file: inputfiles/vec_000003_000001.in
inputfiles/vec_000003_000001.in : Yes : -6.000000000000000e+00
Processing file: inputfiles/vec_000003_000002.in
inputfiles/vec_000003_000002.in : Yes : -6.000000000000000e+00
Processing file: inputfiles/vec_000003_000003.in
inputfiles/vec_000003_000003.in : Yes : -9.999999999999997e-01
Processing file: inputfiles/vec_000003_000004.in
inputfiles/vec_000003_000004.in : Not an eigenvector
```

b. n = 5

```
me22btech11023@edison9:~/ME5470_Assignments/hw1-shriram2096$./a.out
Processing file: inputfiles/vec_000005_000001.in
inputfiles/vec_000005_000001.in : Yes : 2.680980804623304e-01
Processing file: inputfiles/vec_000005_000002.in
inputfiles/vec_000005_000002.in : Not an eigenvector
Processing file: inputfiles/vec_000005_000003.in
inputfiles/vec_000005_000003.in : Yes : 9.868750245348679e-01
Processing file: inputfiles/vec_000005_000004.in
inputfiles/vec_000005_000004.in : Yes : 1.399038515259468e+00
```

c. n = 50

```
me22btech11023@edison9:~/ME5470_Assignments/hw1-shriram2096$./a.out
Processing file: inputfiles/vec_000050_000001.in
inputfiles/vec_000050_000001.in : Not an eigenvector
Processing file: inputfiles/vec_000050_000002.in
inputfiles/vec_000050_000002.in : Yes : 4.796282347010482e-01
Processing file: inputfiles/vec_000050_000003.in
inputfiles/vec_000050_000003.in : Yes : 1.337887289556923e+00
Processing file: inputfiles/vec_000050_000004.in
inputfiles/vec_000050_000004.in : Not an eigenvector
```

d. n = 80

```
me22btech11023@edison9:~/ME5470_Assignments/hw1-shriram2096$./a.out
Processing file: inputfiles/vec_000080_000001.in
inputfiles/vec_000080_000001.in : Yes : 3.330177548672113e-01
Processing file: inputfiles/vec_000080_000002.in
inputfiles/vec_000080_000002.in : Yes : 4.931419807543578e-01
Processing file: inputfiles/vec_000080_000003.in
inputfiles/vec_000080_000003.in : Yes : 9.392745158478987e-01
Processing file: inputfiles/vec_000080_000004.in
inputfiles/vec_000080_000004.in : Not an eigenvector
```

I have checked the edge cases :

1. When vector is 0 : In this case, an eigenvalue cannot exist, hence its not an eigenvector
2. When some elements are 0 in A . v and v : In this case, I check the non zero terms, and if all are equal return the value as the eigenvalue, otherwise return not an eigenvector (since an eigenvalue cant be defined)