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Biophysics Assignment 1

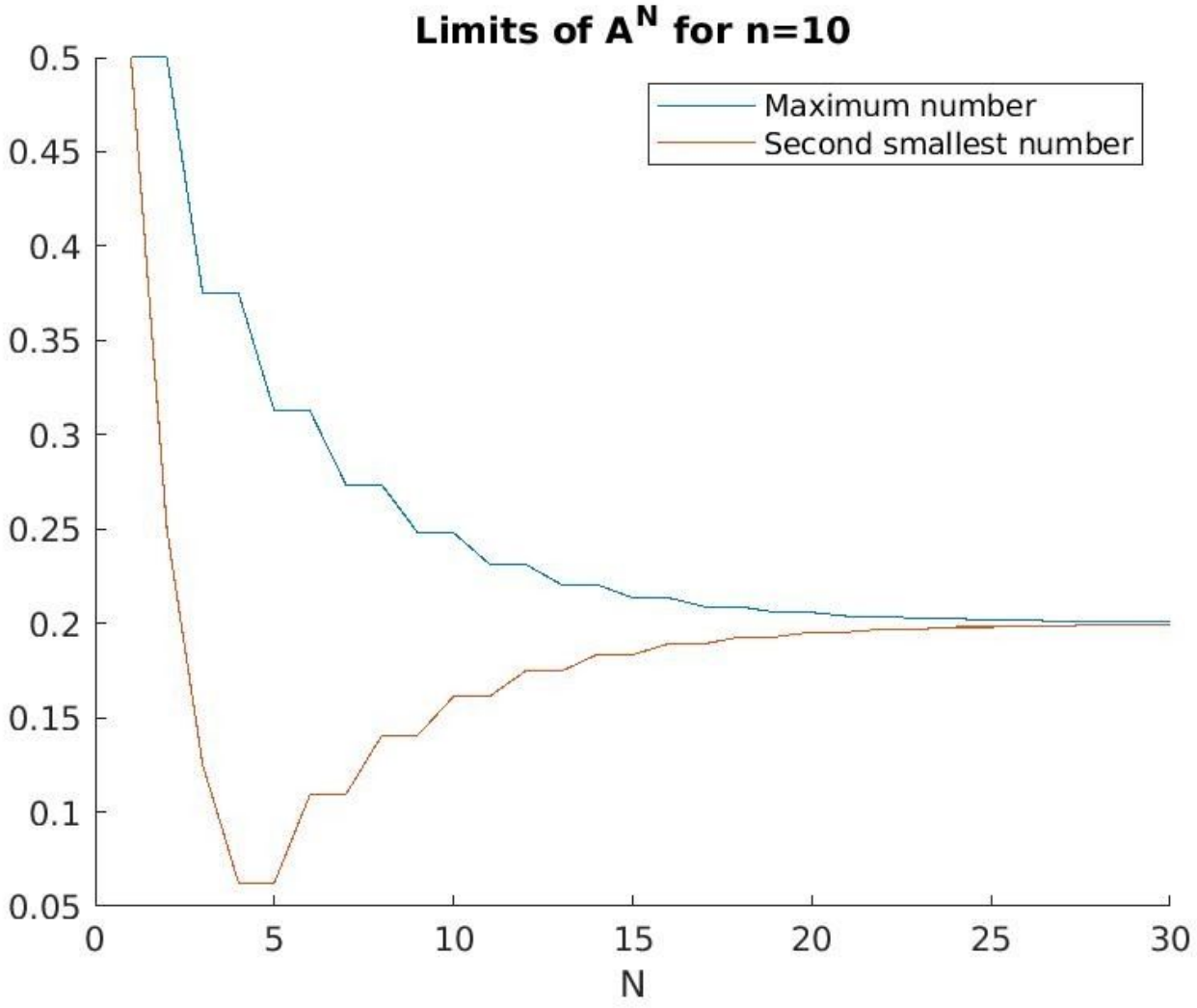
Question 1: Matrix Calculations

a)

A = 10×10

0	0	0	0.5000	0	0	0	0.5000	0	0
0	0	0	0	0.5000	0	0	0	0.5000	0
0	0	0	0	0	0.5000	0	0	0	0.5000
0.5000	0	0	0	0	0	0.5000	0	0	0
0	0.5000	0	0	0	0	0	0.5000	0	0
0	0	0.5000	0	0	0	0	0	0.5000	0
0	0	0	0.5000	0	0	0	0	0	0.5000
0.5000	0	0	0	0.5000	0	0	0	0	0
0	0.5000	0	0	0	0.5000	0	0	0	0
0	0	0.5000	0	0	0	0.5000	0	0	0

b)

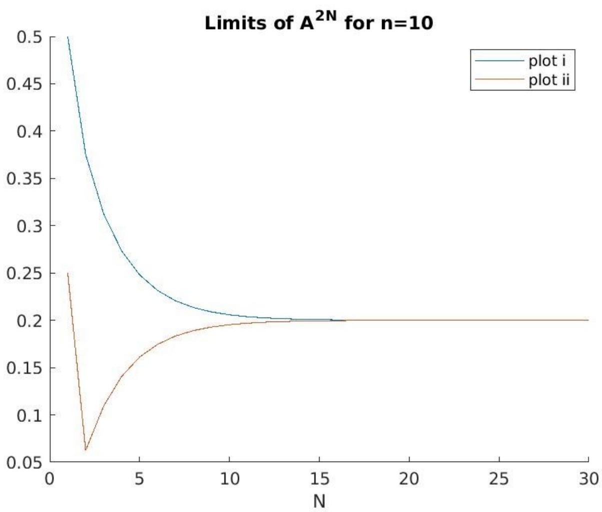


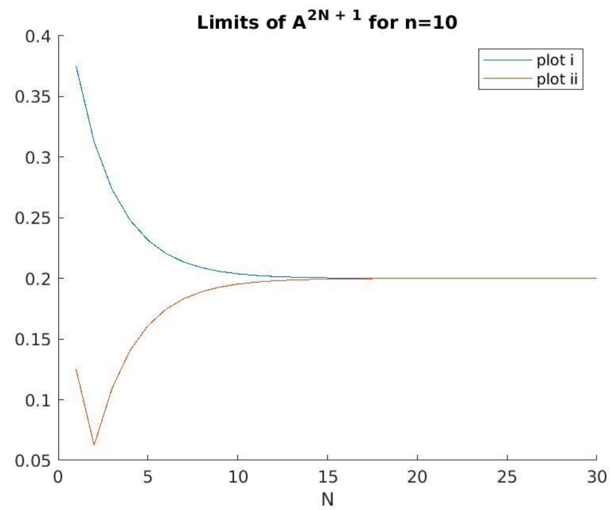
c)

Graphs:

Limit of A^{2N} = 0.200

Limit of A^{2N+1} = 0.200





Matrices:

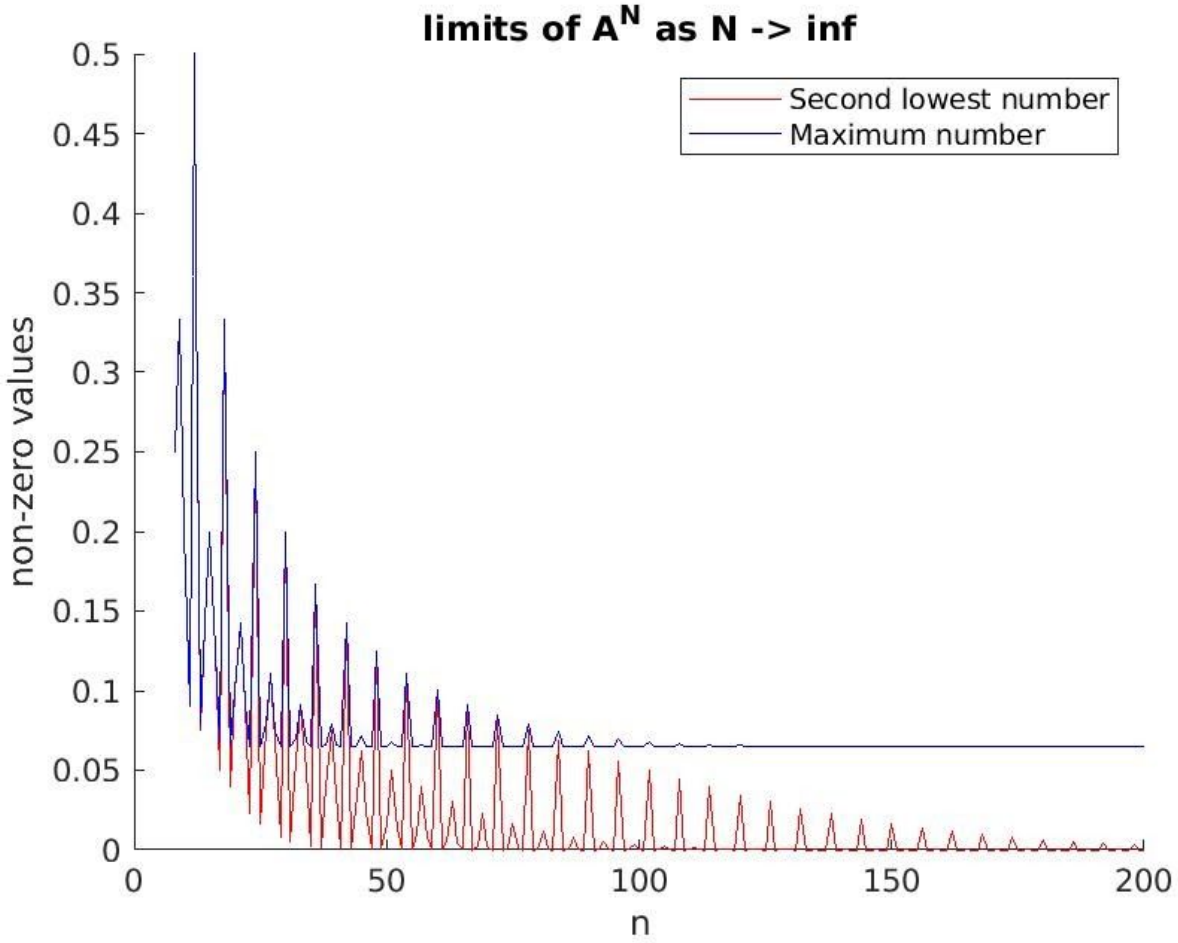
Limit of A^{2N}

```
ans = 10x10
         0    0.2000         0    0.2000         0    0.2000         0    0.2000         0    0.2000
    0.2000         0    0.2000         0    0.2000         0    0.2000         0    0.2000         0
         0    0.2000         0    0.2000         0    0.2000         0    0.2000         0    0.2000
    0.2000         0    0.2000         0    0.2000         0    0.2000         0    0.2000         0
         0    0.2000         0    0.2000         0    0.2000         0    0.2000         0    0.2000
    0.2000         0    0.2000         0    0.2000         0    0.2000         0    0.2000         0
         0    0.2000         0    0.2000         0    0.2000         0    0.2000         0    0.2000
    0.2000         0    0.2000         0    0.2000         0    0.2000         0    0.2000         0
         0    0.2000         0    0.2000         0    0.2000         0    0.2000         0    0.2000
    0.2000         0    0.2000         0    0.2000         0    0.2000         0    0.2000         0
```

Limit of A^{2N+1}

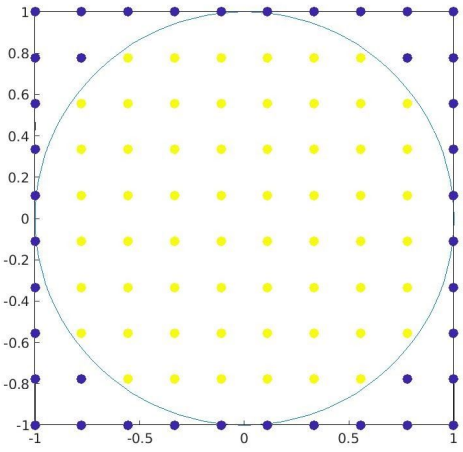
```
ans = 10x10
    0.2000         0    0.2000         0    0.2000         0    0.2000         0    0.2000         0
         0    0.2000         0    0.2000         0    0.2000         0    0.2000         0    0.2000
    0.2000         0    0.2000         0    0.2000         0    0.2000         0    0.2000         0
         0    0.2000         0    0.2000         0    0.2000         0    0.2000         0    0.2000
    0.2000         0    0.2000         0    0.2000         0    0.2000         0    0.2000         0
         0    0.2000         0    0.2000         0    0.2000         0    0.2000         0    0.2000
    0.2000         0    0.2000         0    0.2000         0    0.2000         0    0.2000         0
         0    0.2000         0    0.2000         0    0.2000         0    0.2000         0    0.2000
    0.2000         0    0.2000         0    0.2000         0    0.2000         0    0.2000         0
         0    0.2000         0    0.2000         0    0.2000         0    0.2000         0    0.2000
```

d) The values in the matrices represent the probabilities in a Markov chain.

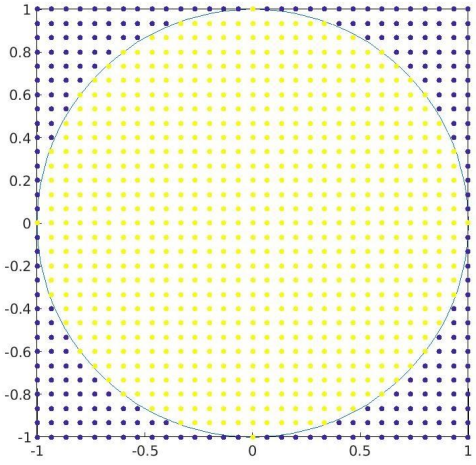


Question 2: Estimating pi

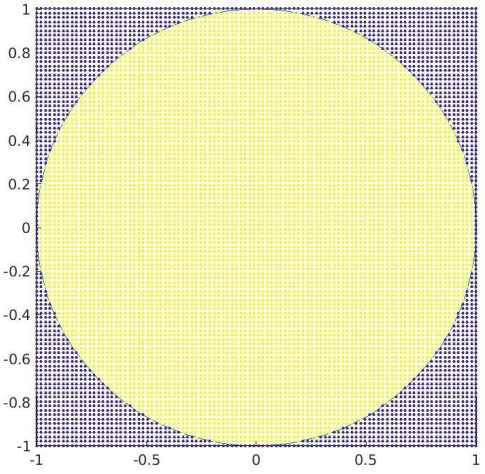
100 points
pi = 2.4



1000 points
pi = 2.95

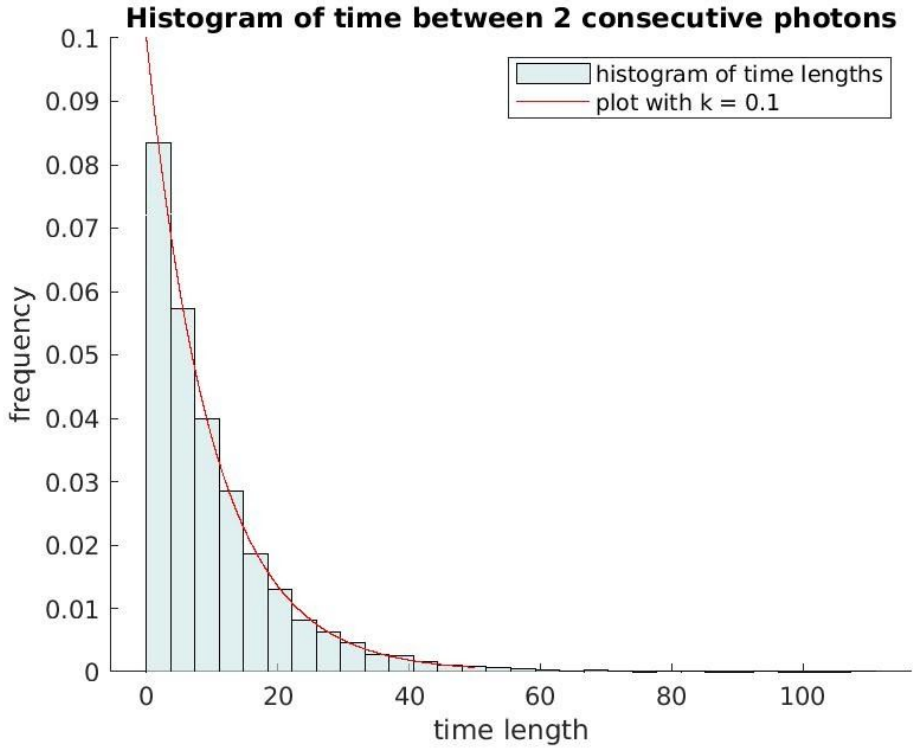


10000 points
pi = 3.06



Question 3: Counting Photons

a) k = 0.1



b) λ = 0.5