Question 1 of 4

Let A be the N by N matrix given by

[1 1 0 0 0 0 0 0 0 ... 0 0
0 2 2 0 0 0 0 0 0 ... 0 0
...
0 0 0 0 0 0 0 0 0 ... N-1 N-1
0 0 0 0 0 0 0 0 0 ... 0 N]

That is, the matrix with entries 1 through N on the diagonal and entries 1 through N-1 on the superdiagonal. Let B=A^2 and let N=1001.

What is the difference between the two largest eigenvalues of B?

SUBMIT ANSWER *and proceed to next question*

Question 2 of 4

Alex, Bob and Chloe are playing a game where each of them chooses a real number between 0 and 1 and whoever ended up choosing the middle number is the winner. Suppose Bob has reason to believe Alex will randomly choose a number between 0 and 1, and Chloe will choose a random number between .5 and .75.

What number should Bob choose to optimize his chances of winning, to four decimal places?

SUBMIT ANSWER *and proceed to next question*

PREVIOUS

Question 3 of 4

You have a receiver that can receive two signals, signal A and signal B. Both signals have 0 mean and typically arrive with equal frequency. Signal A is normally distributed with variance 4. Signal B is normally distributed with variance 9.

You observe a signal with magnitude 2.

What is the probability the signal you observe is signal A, to two decimal places?

SUBMIT ANSWER *and proceed to next question*

PREVIOUS

Question 4 of 4

147! (147*146*145*144* … *3*2*1) has 247 digits. Interestingly, the final N digits of this number repeat.

Find N.

SUBMIT ANSWER *(Last question! Answering this will complete the challenge.)*

PREVIOUS