

AMATH 410
Homework 3: Winter 2008

DUE: 8:30 a.m. on Fri., May 2, 2008

Please note: You are encouraged to discuss the homework and work together. However, it is essential that you prepare your own solution writeup and final MATLAB code.

For each problem: together with any analysis or explanations, turn in both all code and all relevant plots, carefully labeled and with all line styles, marker sizes etc. adjusted for maximum readability, to achieve full credit.

I First, read Lab Manual section 11, and remember that codes can be downloaded – many exercises are partially worked there!

II Probability warmup E+G exercise 3.3.

III Binomial distribution E+G exercise 3.4. Additionally (hint: you should have almost done this already in the course of the exercise) write and save as `RandBinomDirect.m` a function that takes as arguments the parameters (N, H) discussed in class and returns a binomial-distributed random variable with parameters (N, H) . *Turn in the code you used for this.*

IV Markov Chains I E+G exercise 3.6. Additionally: consider the k -step transition matrices A^k (see p. 84-5 of E+G). Plot the nine matrix entries of A^k vs. k . Next, consider a powerful neurotransmitter that switches all channels (i.e., with probability 1) to state C_1 at the initial timestep. Based on your plot, how many steps will it take before the probability of being in the states C_1 , C_2 , and O has returned to within one percent of their equilibrium values? *Turn in the code you used for this.*

V Reverse-engineering the neuron: ion channels. Download the data file `SequenceOfCurrentsDatamatrix.dat`. View the .dat file using the matlab command `edit SequenceOfCurrentsDatamatrix.dat` and read the comments to figure out how to interpret the data. Use analysis similar to that conducted in class to determine single-channel current i and channel count N . Hint: the `polyfit` command (for an order 2 polynomial) is a key step in the analysis – make the best-possible use of the available data! *Turn in the code you used for this.*