

Exam #3 — Linear Algebra Matlab Component

Fall 1997

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Name: _____

Instructions

This part of your exam is closed book, closed notes. You are allowed to view and examine any of Matlab's help files, but you are not allowed access to any other on-line materials. The exam must be completed at one sitting in PS116 and handed in to my office before 4:00 pm, Wednesday, November 5, 1997. Write out and sign the following honor pledge on the cover page of your completed work.

I promise that all the work contained in this paper is my own. I received no help from friends, fellow students, or other teachers. Any and all questions I had pertaining to this exam were directed to my instructor, David Arnold. I promise not to discuss this examination with any class mate who has not yet taken the exam.

All graphs must have appropriate labels for the axes and title. Please do not waste paper printing in the lab. Don't send output to the printer just to "see" what it looks like. Wait for the "perfect" picture before sending your work to the printer.

A New Zealand Sheep Model

The following data is taken from *Parameters for Seasonally Breeding Populations*, a paper in *Ecology* (48 (1967) 834-839). The study was taken on female sheep. The age categories are in years. The birth rates represent the average number of female babies produced by an individual female sheep in a particular age class. The survival rates are the proportion of sheep surviving a particular age class and moving on to the next age class the following year.

Age (years)	Birth Rate (yearly)	Survival Rate (yearly)
0-1	0.000	0.845
1-2	0.045	0.975
2-3	0.391	0.965
3-4	0.472	0.950
4-5	0.484	0.926
5-6	0.546	0.895
6-7	0.542	0.850
7-8	0.502	0.786
8-9	0.468	0.691
9-10	0.459	0.561
10-11	0.433	0.370
11-12	0.421	0.000

Suppose that a rancher begins with 100 sheep in each age category.

1. How many sheep will be in each age category after 10 years? After 20 years?

2. Plot the graph of the oldest age category over the first 10 years. Can you express some concerns the rancher might have about his oldest aged sheep?
3. Plot the graph of the oldest age category over the first 20 years. Write a short paragraph explaining possible causes for the sudden revival of this age class.
4. Sketch a semilog plot of the sheep population over the first 20 years. What accounts for the sharp peaks of age class increase in each plot? (*Legend not required.*)