

Math151 at the University of Tennessee, Knoxville - Chat for October 26, 2015 with the course instructor, Louis Gross.

I will be online starting at 8:30PM and will be happy to answer questions regarding any aspect of the course, assignments, etc. You can type in this document to ask questions.

When you ask a question, please do not use your name because this document will be saved and publicly posted after we close it. I will be on-line at least until 9:30PM but will stay on longer if there are still questions. Note that I do not know the identity of anyone posting questions - each participant shows up as "Anonymous" animal.

I am now online. - Lou

How do you go about,
on the practice exam, doing 4, part a.

Could you go over question 2 on the practice exam? I keep getting the wrong answer.

Can you do question 3 on practice exam

OK for #4 you first are told this is a semilog graph and you can see from the graph that the vertical axis is scaled logarithmically. So this means that a straight line on the graph has equation of a line with the vertical (y) value having a log scaling. So the equation for the line is $\log(A(t)) = m t + b$

where we need to find the slope m and the intercept b.

We are given two points (3, 10) and (6, 50) so we first find the slope realizing that the vertical values need to be log scaled

$$\text{so } m = (\log(50) - \log(10))/(6-3) = (\log 5)/3$$

then to find b we plug in one of the points - suppose we use (3,10)

$$\log(10) = 3 (\log 5)/3 + b \quad \text{so } 1 = \log 5 + b \quad \text{so } b = 1 - \log 5$$

then the equation is

$$\log(A(t)) = t (\log 5)/3 + 1 - \log 5$$

then to get just $A(t)$ by itself raise 10 to both side to get

$$A(t) = 10^{t (\log 5)/3 + 1 - \log 5} = 2 \cdot 5^{t/3}$$

Any questions about steps along the way here?

Yes, could you please explain going from $A(t) = 10^{t (\log 5)/3 + 1 - \log 5} = 2 \cdot 5^{t/3}$?

OK - first remember that $10^{(a+b)} = 10^a 10^b$ where here $a = t (\log 5)/3$ and $b = 1 - \log 5$
then

$$10^{t (\log 5)/3} = 10^{\log(5^{t/3})} \text{ and the log and } 10^\wedge \text{ are inverses so we get } 5^{t/3}$$

$$\text{and } 10^{1-\log 5} = 10^1 / 10^{\log 5} = 10/5 = 2$$

OK?

Yes, thanks!

OK then for question #3 is there a particular part you want me to do or the whole problem? Do you know how to find the projection matrix from the data in the problem?

No, if you could do the entire problem it would be most helpful

OK - let's start with the data given us. Since we only have two classes F and S for biennial plants, the projection matrix will be a 2x2 matrix. We are told 10% of F survive to S and that only the S individuals produce offspring (90 F plants survive) so the matrix and general projection is

$$\begin{bmatrix} 0 & 90 \\ 0.1 & 0 \end{bmatrix}$$

so the equation for part a is

$$\begin{bmatrix} F \\ S \end{bmatrix} = \begin{bmatrix} 0 & 90 \\ 0.1 & 0 \end{bmatrix} \begin{bmatrix} F \\ S \end{bmatrix}$$

where the left side is at time 1 and the right is at time 0
forget the } there - they are from my messed up formatting of the equation.

So for part (b) after one year we get

$$\begin{bmatrix} 0 & 90 \\ 0.1 & 0 \end{bmatrix} \begin{bmatrix} 10 \\ 2 \end{bmatrix} = \begin{bmatrix} 180 \\ 1 \end{bmatrix}$$

and at time 2 we get

$$\begin{bmatrix} 0 & 90 \\ 0.1 & 0 \end{bmatrix} \begin{bmatrix} 180 \\ 1 \end{bmatrix} = \begin{bmatrix} 90 \\ 18 \end{bmatrix}$$

then for part (c) we need to find the characteristic equation and the dominant eigenvalue which is from $\lambda^2 - 9 = 0$ which gives $\lambda = 3$ and $\lambda = -3$ so the dominant one is $\lambda = 3$ so after a long time the population grows at a rate of increase of 3 each time period and if we had 1000 present at time 100 then we'd have approximately 3000 present at time 101.

For part (d) we need the eigenvector for $\lambda = 3$ which we get by solving

$$\begin{bmatrix} 0 & 90 \\ 0.1 & 0 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = 3 \begin{bmatrix} x \\ y \end{bmatrix}$$

from which we see that $x = 30y$ so an eigenvector is $\begin{bmatrix} 30 \\ 1 \end{bmatrix}$ and if we normalize this we get

$$\begin{bmatrix} 30/31 \\ 1/31 \end{bmatrix}$$

so those are the long term fractions of the population which are F and S

THANK YOU

Can you do number one and work it out completely please?

Do you want all parts of #1 - or do you know how to add and subtract matrices - which are giving you a problem?

Lets just do the whole practice test.

Nope not going to do that - Lou

I would like to see just the last part of number 6, please?

For the last part of number 6 you would say: to find the long-term fraction in eachs tate I would first find the dominant eigenvalue then find the eigenvector associated with the dominant eigenvalue then normalize this and it would give the long-term fraction in each state. Since this is a Markov chain matrix (or transfer matrix) with columns summing to one, the dominant eigenvalue is one - thus to find the long-term fraction in each state you'd find the eigenvector corresponding to one. Then to actually do this you can get the extra credit points - do you want me to show this?

It would be really helpful if you could work out the extra credit on how to calculate the long-term fraction of individuals in each state!

So are you gonna do 1 lmao

Could you give us a layout of the format we need for the project? I am just confused on how to execute the .m files you gave us.

Once you have modified the .m files from the ones I mentioned in class that are posted on the site you need to run them to look at the different cases in the parts of the project and you can do this in a single m file or in several - I don't care but if you use several m files just be sure to include each of them.

I am having trouble with the project. I'm using the m-file you uploaded online but I'm still having trouble understanding what does what.

What lines don't you understand in which m file?

I get lost when I get to the for loops.

The for loops such as

for t = [1 2 3 4 5 10 20 30 40 50 100 200]

then some calculations

end

just goes through and plugs in each of the values for t wherever it occurs on the calculations, starting with t = 1 then 2 then 3 then 4 then 5 then 10 then 20 etc.

A loop such as

```
for i = 1:length(f)
    some calculations
```

```
end
```

takes and puts first i = 1 in the calculations, then i=2 then i =3 and so on until i = the length of the array f

Okay. Thank you!

Are we supposed to use the .m file on leslie population table and repeat that for calves, yearlings, and adults?

Actually, you don't want to use this one for parts (c) (d) and (e) - you use the LeslieFecundity .m file which shows you how to make several different population projections using different fecundity values. You need to modify this to change calf survival and adult survival for the different parts.

Which parts of the project go with which .m file? Specifically (a) and (b), along with #2.

Part (a) uses something very similar to LesliePopulationTable.m while part (b) uses something very similar to Leslie PopulationPlot.m and as noted above use LeslieFecundity .m file for parts (c, d, e)

How do you go about plotting for part (b)?

Part b - a good example of how to do this is in Leslie PopulationPlot.m all you need to do is modify the matrix and choose the correct set of times

I'm getting "Error using plot. Vectors must be the same length" with 1. ©

I'm not sure what you are running - are you saying that when you run one of the codes that I posted you get this error or is it a .m file you created?

It's an m-file I created.

Please post the line that gives the error and I can try to see what the error is - my guess is that the length of the arrays isn't correct.

```
plot(f, c, 'r-', f, y, 'g-', f, a, 'b-')
```

OK my bet is that you have different lengths for the f c, y and a vectors. - do the following

```
length(f)
```

```
length(c)
```

```
length(y)
```

```
length(a)
```

these should all be the same number

f is shorter, but the problem says "Change the adult bison fecundity to 0.2, 0.42, 1.0, and 1.4". So f is only four values long.

Right so in LeslieFecundity.m if you use the same type of structure as in the original program then

```
for i = 1:length(f)
```

should only loop over the four values of f

```
c = normv(1,:);
```

```
y = normv(2,:);
```

```
a = normv(3,:);
```

This is how you get c, y, and a right?

Yes, this assumes that you have indeed got the eigenvectors for the diominant eigenvalue into normalized form and that is what is in normv

so you did

```
[v,lambda] = eig(A);
```

```
normv(:,i) = v(:,1)/sum(v(:,1));
```

Yes, and i did the fprintf after that

Maybe the problem is that in the fprintf statement you are just printing out the normv(1,i) etc. right - it should loop through only 4 values for these in this case while

```
the c = normv(1,:);
```

```
y = normv(2,:);
```

```
a = normv(3,:);
```

should be outside the loop = the end statement for the loop should appear before this.

It does appear after the end statement

OK - what is `length(v)` and `length(f)` and `length(normv)`

3, 4, and 10

There is something funny with your `normv` length -

what is

`length(normv(1,:))`

also 10

What is

`size(normv)`

it should be 3 4

It's 3 10

OK - there is something wrong with how you have set up the loop or the size of `f` - not sure where it is in your code without looking at the whole thing. You can email it to me if you want and I can try to look at it

Sounds good, I'll do that.

I have a question about inserting exponential equations in matlab. Getting an error for raising an exponent variable. Trying to plug in $x(t) = A^t * x(0)$

I'm not sure what you are doing here - post the matlab code that is causing the error

I am having the same problem when trying to plug in $x(t) = A^t * x(0)$.

Could you provide a sample problem like we would see from chapter 5?

Look at the Chat posting for October 12 when I did these

% Each row will correspond to a time step (t=0 to t=200)

`x = zeros(51,3);` → This part of the plotting is troubling me the most. Could you show me how it should look for the project?

What this line does is just create a matrix with 51 rows and 3 columns each which start out with a zero in them. I assume you are in `LesliePopulationTable.m` - right?

I actually got that from the LesliePopulationPlot.m, are we not supposed to use that one?
Yes that is for part (b) of the project - so in this case since there are 100 time points not 51 you should set the matrix x to be larger

so

`x=zeros(101,3)`

and then each row of x will correspond to one of the time points t

Could you work out parts b and c for number 6 on the practice exam please?

For part b you need to just multiply the matrix (do you see how to get this from the figure) time the vector

$$\begin{bmatrix} 1000 \\ 10 \\ 0 \end{bmatrix}$$

the matrix is given on the answer sheet - do you understand how to get it?

I said how to do part (c) above

Anything else - if not I'm going offline Lou

OK goodnight all.