Math152 at the University of Tennessee, Knoxville - Chat for February 25, 2016 with the course instructor, Louis Gross.

I will be online starting at 7:30PM and will be happy to answer questions regarding any aspect of the course, assignments, etc. though for this evening I suspect that questions will be mostly about the upcoming exam and the project assignment. 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 8:30PM 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 online now - Lou

Dear Dr. Gross, would you mind working number #2 on the practice exam? Also, I’m confused on how to solve optimization problems, do you have any suggestions as to how to approach them? Thank you!

First, regarding optimization problems, I assume you mean word problems and not ones in which we give you a function to find the maximum and minimum of.

The objective in an optimization problem is to get a function of a single variable so you can take its derivative, set it = 0, and find critical points where a max or min can be. So the first step is to define the variable you want to maximize, the next step is to write this as a function of the other variables, then see if you have it as a function of a single variable and then take the derivative and set it = 0.

Let's use #2 on the sample as an example. we are told to find the web size that maximizes daily intake minus cost. So let's consider how we can measure web size and the food intake and the cost. The problem says the food intake is proportional to the web radius, so it would be natural to let the web radius be a variable - call it R. Then if F = food intake the problem says

F=kR where F is measured in calories

for some constant k which we have to find. We are told F= 120 when R = 10 cm, so from this we can find k since we get 120=10k so k = 12. This means

F=12R

Next we are told the cost of the web, which we will call C, in calories, is proportional to area of the web. We could let A = area but since we are told the web is circular, the area is πR^2 so this means we can write $C = a\pi R^2$ where a is a constant. But we are told the cost is 30 when the area is 100 so 30=a100 so a=.3

So we are now ready to write what we want to maximize which is F-C as a function of R

$$F - C = 12R - .3\pi R^2$$

Then we take the derivative of this with respect to the variable R set it =0 and find critical points. The derivative is

$$(F - C)' = 12 - .6\pi R$$

and setting this =0 we see that the only value of R that makes this =0 is

$$R^* = \tfrac{20}{\pi} = 6.37$$

and then we just need to check that this gives a maximum. To see this use the second derivative which is $-.6\pi$ which is negative which means that the function F=C is concave down and so this value of R* must give a maximum. We could also have used a sign chart to see that the derivative is positive to the left of R* and negative to the right of R* so the function F-C must be maximized at R*. So the web size that maximized food intake minus cost is a web with radius 6.37 cm

I would like to take a look at number 5 on the practice exam. I don't even know where to start. Also, is there a typo on the answer to number 4? for k= ln 3/10=.11, I get -ln (⅓)/10, which is still .11…

For #5 on the exam, you are given the function to maximize so the only issue is to make sure it is a function of a single variable so you can take the derivative. In this case the function R which gives the recruits also has several other letters (a and b) in it, but we are told these are constants so they do not vary. This means that we treat a and b as constants and so R is just a function of the variable S which is the number of spawning fish the previous generation. So take the derivative of the given function R and set the derivative =0 to find the S value which maximizes R.

Regarding your question about #4

$-\ln(\frac{1}{3}) = \ln 3$

so it is the same answer as on the sheet.

OK?

ok

For the matlab assignment, the last 2 parts says to solve for the limits of s and n, is there calculations involved in this answer or is it more of a conceptual answer? if it is more conceptual, wouldn't the answer be very similar to the previous 2 questions? where, as n gets larger (approaches inf.) SID approaches __, and the diversity becomes more ___. (I didn't want to give away my answers…)

This is a good question - we didn't specify but you can actually do these problems either conceptually or numerically plugging in some particular cases, in the case we discuss with the same number of individuals n in each species so if there are S species then there are nS =N total number of individuals. It is likely easier to do conceptually.

I wrote my response more conceptually, but to understand it I plugged in larger and larger numbers for n for the first lim and larger and larger numbers of S for the second limit (just to show myself exactly what happened)

That's good - it is sort of a check to make sure you got the answer right.

Thank you for your time. I haven't had time to complete the rest of the exam, but when I do I'm sure to have more questions.

If there aren't more questions I am going offline - goodnight.