Math151 at the University of Tennessee, Knoxville - Chat for December 1, 2015 with the course instructor, Louis Gross.

I will be online starting at 7PM 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 8PM 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 if there are questions - Lou

Could you go over number 3 and 4 on the study guide?

OK - #3 is to solve $x_{n+1} - 3x_n = 5$ where we also have initial conditions $x_0 = 4$

To solve this we can either remember the solution to the first order linear difference equation $x_{n+1} = ax_n + b$ which has solution $x_n = ca^n + b/(1-a)$ or we can think of this as a solution to the homogeneous equation $x_{n+1} = ax_n$ and then add a particular solution to the first case.

If we use the formula we just need to find ourt what the a and b are so arrange the given equation in the same way the given equation is $x_{n+1} = 3x_n + 5$ and from this it is clear that a=3 and b = 5 so then we just plug into the formula for the solution to get $x_n = c3^n + 5/(1-3)$ or $x_n = c3^n - 5/2$ and then we just need to find c to get the solution for the given initial condition. We are given $x_0 = 4$ and when we plug in 0 for n in the equation we have for the solution we get $x_0 = c3^0 - 5/2$ which must =4 so c = 4+5/2 = 13/2 so the final solution is $x_n = 3^n 6.5 - 5/2$

Is this OK - do you want me to do it without using the formula?

could you do it without the formula?

OK - without the formula we just need to add the general solution for the homogeneous part of the equation $x_{n+1} = ax_n$ to any particular solution to the full equation $x_{n+1} = 3x_n + 5$

So the solution to the homogeneous part $x_{n+1} = 3x_n$ is easy since we are just multiplying by 3 each time period so after n time periods we have multiplied by 3^n and this is multiplied by whatever the value is at time zero - call this c for now - so the solution to the homogeneous equation is $x_n = c3^n$. Then we need a particular solution to the full equation and the easiest way to find this is to assume that the solution is a constant K so set $x_n = K$ and $x_{n+1} = K$ and then we get $K = 3K + 5$ which allows us to find K = -5/2 and we add this to the solution to the homogeneous equation to get $x_n = c3^n - 5/2$ just like we had before. What is left to do is to use the initial condition to find c which is done just like we did above.

OK?

yes, thank you

OK - now for #4 this is a limit of a sequence and the key idea when you have something like this is to remember the basic limits that $lim_{n\to\infty} 1/n^k = 0$ because you are dividing 1 by a number that is getting larger and larger for any power k we put in. so $lim_{n\to\infty} 1/n^2 = 0$ for example. then when we have something like the given problem, we look for the highest power of n around and divide numerator and denomenator by it to see what happens. So we want $lim_{n\to\infty} \frac{2n-3}{5n+2}$ and so the highest power of n around is the first power so divide top and bottom by n to get $lim_{n\to\infty} \frac{2-\frac{3}{n}}{5+\frac{2}{n}}$ and then using the properties of limits this limit is the limit of the numerator divided by the limit of the denominator and the top goes to 2 and the bottom goes to 5 so the limit is ⅖. Note that one way to think about this is that you plug in larger and larger valiues of n and in the top this gives 2 + a number that gets closer and closer to zero and in the bottom this gives 5 + a number that gets closer and closer to zero as n gets larger.

OK?

Now for part (b) we do the same sort of thing - we look for the highest power of n around which for this case $lim_{n\to\infty} \frac{3n}{3n^2+6}$ the highest power of n around is n^2 so divide top and bottom by n^2 to get $\lim_{n\to\infty} \frac{\frac{3}{n}}{3+\frac{6}{n^2}}$ and here we look at the limit of the top as n gets large we see that we get 3 over a number that gets larger and larger so the top gets closer and closer to zero while the bottom is 3 + a number that is getting closer and closer to zero so the bottome gets closer and closer to 3. So the entire fraction gets closer and closer to 0/3 = 0

OK?
What chapter is half lives and limits?

Limits of sequences is in Chapter 5 and

half lives is in chapter 4.
Ok thank you.
Will the TAs be at the review tomorrow along with our test if we have not got them?

I will be there the TAs will not but I'll bring any left over exams that have not been picked up yet.
Ok thank you.

If we cannot make the review session on Wednesday, we still will be able to review online with you at the same time right?

Do you mean online tomorrow night? If so I will be online tomorrow night at 7PM again. I am also on campus on Thursday as are the TAs if you have last minute questions. I have meetings from 10-noon but will be around Thursday afternoon in my Austin Peay 401B office.

Yes, that is what i meant, thank you very much. Ah great, thank you for that information as well.

Should we email you to tell you if we are coming on Thursday?

Yes it is always best for me to know what time you are coming by so I don't get caught in something else then. You can als
o see the TAs

okay, thank you
So do any of our notecards from the class work get dropped?

Yes - the way I announced this in class was that there are 22 notecards that were done and of these we will count the highest 15.

Could you go over #9 on the sample final exam?

Perhaps the best way to do this one is to use a Venn diagram but that is going to be hard for me to do in google docs. So I will do this using event notation but you should realize that it might be easiest for you to think of it as a dart board situation. So we have only a few events
let B = event that a camper brushes their teeth daily

W = event that a camper bathes daily
and we are told that
P(B)=.3 and P(W) = .6 and $P(B \cap W) = .2$
so then we want to find for (a) $P(B \cup W)$ and we can use the formula that
$P(B \cup W) = P(B) + P(W) - P(B \cap W)$ so we get

$P(B \cup W) = .3 + .6 - .2 = .7$
For part (b) we want to find
$P(B \cup W) - P(B \cap W)$ which is .7 - .2 = .5
and for part (c) we want to find $P(\overline{B} \cap \overline{W})$ which is $1 - P(B \cup W) = 1 - .7 = .3$

For number 4, cant you just put in a very large number to get the limit? At what point would that no longer work?

Yes you certainly can just put in a very large number for the n in each part of the limit and you will see as you do so you get a number that gets close to the limit value. But I caution you not to just plug in 100 and give what you get as an answer - plug in 100, tghen 1000, then 10000 etc to see what it gets close to.
Is there a time that wont work?
This won't work unless you have a way to plug in the entire formula into your calculator. For example in the problem above #4 (b) you need to have your calculator find the quotient and not just plug in larger and larger numbers in the numerator and denomenator separately. You need to take the quotient for each n that you plug in. If you do this it will work. For all our cases it will work fine as long as you plug into the full formula for the sequence. We will see a more detailed set of properties of limits when we do calculus in 152.

If there isn't anything else for now, I am going offline.

Goodnight.