Math152 at the University of Tennessee, Knoxville - Chat for February 8, 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 Chapters 15-17 and the upcoming exam on Tuesday. 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

Could you go over #10 on the study guide?

I assume you mean the sample exam - so for this we want a function for which the graph of the function has no "hole" and doesn't "blow up at x=a, but has a "point" at x=a so that coming into this point from the left side we get a difference ration - the (f(x)-f(a))/(x-a) - that has different values when x is smaller than a and x gets closer to a than it does when x gets close to a from above. I went over some examples of this in class today - the idea is that the graph of the function has a sharp point at x=a. So an example is the graph of f(x)=|x-a| which has slope 1 for x>a and slope -1 for x<a. But there are many other examples. You could have a function that is defined piecewise and has a point. One example would be f(x)= x for x>0 and f(x) = x^2 for x<=0

OK?

Could you go over #2 on the sample exam?

For this we are looking for a value for P so that when I gets very large (it doesn't make sense for I which is light level to go to - infinity), the value of P(I) approaches some fixed value.

$\lim_{I \to \infty} (\frac{3I}{.1I+25})-3$ and if we divide numerator and denomenator by I in this we get

$\lim_{I \to \infty} (\frac{3}{.1+\frac{25}{i}})-3$

and here we see that we get as I gets large 30-3 = 27 so the horizontal asymptote is y=27 (or P=27 - it doesn't matter what we call the vertical axis variable). What this represents is the limiting highest level of photosynthesis that arises when light level gets larger and larger. Of course in reality the largest value for I (light level) is full sunlight - it isn't infinite - but for this equation (and virtually all plants) the photosynthetic rate reaches its limiting value (we call this the light-saturated value) well below full sunlight.
OK?

Could you go over both parts of #9 on the sample exam?

The average rate of change of metabolic rate is the difference in metabolic rate over the day divided by the time period. So we need to decide whether we are measuring time in hours or days. Since the formula for M(t) is correct when t is measured in hours, we should use hours when we plug in the times - so we are going from 0 to 24 hours. So the average rate of change is M(24)-M(0) divided by the time period which is either 1 day or 24 hours depending upon what units we want to use. M(24)-M(0) = 48 so if we divide by 1 days we get the average rate of change of metabolic rate to be 48 g O_2 /minute/day or we could say that the average rate of change over the day is 48/24 g O_2 /minute/hr

OK?

For part (b) we want to estimate the rate of change at a particular time. So we need to decide what method to use. If we use the one in the book for which we average the two rates of change just before t=6 and just after t=6 then the formula we are going to use is

$$(\frac{M(7)-M(6)}{7-6}+\frac{M(6)-M(5)}{6-5})\frac{1}{2}$$

and this gives when we plug in the values for the formula for M 26 g O_2 / minute/hr
OK? Note that there are other ways to calculate the rate of change of a function ar a point so this problem doesn't have a single unique correct answer

Could you go over #3, #5, and #8?

I went over #3 in class - the examples all either jumped heights at x=2 or blew up (or blew down towards - infinity) at x=2. I gave several examples in the answer sheet but there are lots of others. If you have a question about whether a particular function works for this problem, ask about it.

For #5 a - just plug in the formula for W(t) with t=25 and you get the answer on the sheet. fpr (b) you know that each of the two pieces of the function that defines W(t) are continuous (because any polynomial is continuous, so the only thing we need to check is that the function values at t=28 are the same, which they are not. So there is a jump at x=28 and so the function is not continuous on the interval (0,56) since it has a jump at t=28

For #8 we need to think about the units - we are told this is a change in body weight which means f(c) must have units weight/time. But it is a function of caloric intake in calories so when we are told f(200)=3 this means that the change in body weight over a day is 3 grams when the caloric intake of the mouse is 200 calories. For (b) the derivative of f(c) is the rate of change of body weight change per small change in caloric intake of the mouse. so f'(12)=0 means that when the caloric intake is 120 calories, the rate of change of body weight per unit change in calorie intake is zero. So at 120 calorie intake the change in body weight per day is not changing. The units of f'(c) are change in body weight per day per calorie or g per day per calorie
OK?

How do you do #7?

We are asked to estimate the rate of change at a particular time from the data, not an average rate over some time period. So we need to use some way to estimate rate of change. So this is really a similar problem to #9b and we can find the rate of change at t=1 by averaging the change just before t=1 (from t=0 to t=1) and just after t=1 (from t=1 to t=2) so we get for this ((150-200) + (112-150))/2 = -44 mg/ml/hr
You estimate it at t=4 exactly the same way.
OK?

Limits are still giving me a hard time, could you do 1 a so I will see how to do the rest

Sure - for 1(a) we are letting y get larger and larger - so if we just look at the formula it looks like we are going to get infinity/infinity which is what we called indeterminant form - you can't tell what will happen immediately. The usual trick is to divide top and bottom by the highest p[ower of teh variable (in this case that is just y) to get

$$\lim_{y\to\infty}\frac{4-y}{2y+3}=\lim_{y\to\infty}\frac{\frac{4}{y}-1}{\frac{2}{y}+3}=\frac{-1}{2}$$

OK?

Can you please work out #6?

Here we are given a formula for weight of a squirrel and want to find the average weight of change of body weight over the interval from 1 to 4 months. So we take the difference in body weight over this time period divided by the length of the time period to get (B(4)-B(1))/(4-1) and if you plug these into the formula for B(t) you get the answer 300 g/month since the weight is measured in grams and the time period lengths are measured in months.
OK?

Im confused on #4, could you please explain this one?

I went over this in class - first you draw the graph for each of the sections of these functions that are defined piecewise and then see if the sections match up at their endpoints or whether the functions blow up somewhere. I can't easily draw the graphs now in this google doc but you can see in (a) that if we plug in x=-1 f(-1)=0 but just to the right of x=-1 the graph gets close to 1 - so the graph jumps there at x=-1 and thus it is not continuous there. If you check near x=1 you see the function doesn't jump there so it is continuous at x=1. You do (b) similarly by graphing each of the pieces.
OK?

how do you get 7/2 for 1.b)? I keep getting 4.

The limit is x getting close to 3 so just plug in 3 - I guess you may be thinking of the case x goes to infinity.

If there isn't anything else I am going to log off - good night and best wishes for a pleasant evening.