REVIEW FOR TEST 3 OF CALCULUS I:

The first and best line of defense is to complete and understand the homework and lecture examples. Most of the test will be like problems you've done before, they may not be the same format but they should require the same skill set.

• This test covers all of my Chapter 6. You are also still expected to know material from previous tests although that is not our focus here. This amounts to sections 4.1, 4.2, 4.3, 4.4, 4.5, 4.7, and 7.8 in Stewart's Text as well as a little extra on Taylor's Theorem.

Applications of Derivatives:
[Items 1-11 are covered in part by HP8, Items 12- 17 were covered in part by HP9

1. Be able to state the Intermediate Value Theorem, Rolle's Theorem, Fermat's Theorem, Mean Value Theorem(MVT) and the Extreme Value Theorem. It is entirely likely I will ask you to state them on this Test. (you can either use my notes or Stewart, it is important you state the preconditions for each Theorem)

2. Be able to apply Rolle's Theorem and the MVT to solve problems as you were called to in HP8.

3. What is a critical number? What is a critical point? Given a particular function, is there a critical point for every critical number? If not give an example of a function with a critical number but no critical point.

4. Be able to find critical numbers.

5. What is an absolute extrema? What is the closed interval method? How is this different than finding local extrema via the first and second derivative tests? How is it the same?

6. When is a function increasing/decreasing? Be able to set-up a sign chart (or other equally neat organizational device) to easily read intervals of increase/decrease from the sign of $\frac{df}{dx}$.

7. Geometrically speaking what is the meaning of concave up/down? Be able to set-up a sign chart (or other equally neat organizational device) to easily read intervals of concave up/down from the sign of $\frac{d^2f}{dx^2}$.

8. What is an inflection point? Do inflection points have to be at critical points?

9. What is the first derivative test? How and when can you apply it? What does it find for you? What does it not find?

10. What is the second derivative test? How and when can you apply it? What does it find for you? What does it not find?

11. Be able to put together increase/decrease, concavity, local maximums, local minimums and other useful information to sketch a graph.

12. Optimization. In most cases you need to first set up the problem, drawing a picture tends to help. Also, it is not enough to just find the critical number, you must use calculus to verify that it is a maximum or minimum. I will be picky about omitting this in your solution, you are warned.

13. Memorize the basic limits at infinity. Or be able to figure them out from a graph, or arithmetic reasoning (like 1 / big # is tiny etc…). I assume you know limits of inverse tangent, if we covered it in lecture you are to know it. This again goes back to your foundational knowledge of the elementary functions. Can you picture polynomials, exponentials, logs , trigonometric and basic rational functions without plotting points? You should be able to. This is one way I calculate limits at infinity. Of course, if you are wise, you can use the calculus of graphing to help complete partial knowledge if your memory fails you… well, that's how I think… you are mostly free to think how you like so long as you can answer the questions.

14. There are basically only two or three tricks to calculate indeterminant limits here. Make it a point to know them. Of course the next item gives an alternate approach on the algebraic solvable limits however, L'Hospital's Rule isn't good for all problems.

15. What is a horizontal asymptote, what does that have to do with these limits at infinity? What is a vertical asymptote? Give an example of a function with both and write the equations for the asymptotes. I may ask you to give me the equations of the asymptotes (VA or HA) for some function.

16. Know what L'Hospital's Rule says and what it does not say. Be able to work problems like those we did in lecture and appeared in HP9.

17. I will state the Taylor polynomial formula for you if there is a test question about it. I will not test on the error estimation in Taylor's polynomial examples on the in-class portion of the test. Those are for the interested student only. On the test I will at most ask you to do something like re-center a polynomial at some nonzero center (we did this sort of problem in lecture), or to read the derivative from the Taylor polynomial. Again, I give the formula so this is little more than a game of matching. It is a game worth playing.

Tentative Breakdown of Test 3:

1.) [15pts] memorized theorems and definitions. [you should know the definitions in my Chapter 6 especially, ignoring of course Taylor Theorem section where I have already expressly ruled that out in this review]

2.) [15pts] find critical numbers and intervals of increase or decrease

3.) [15pts] find intervals of concavity and any inflection points

4.) [15pts] conceptual question(s) about graphing, will test if you understand the big picture about graphing. Chapter 6 is a story, do you know all the characters? Might ask for counter-examples or examples. Or perhaps I give a sign-chart for a function you do not have the formula for and ask you to extract information from the sign-chart.

5.) [20pts] optimize it. You must follow instructions. If the answer is obvious that does not negate the need for you to follow the instructions. Likely is the case that they will read: "find the max(min) value of something using the min/max theorems of calculus" [might need closed interval method]

6.) [20pts] optimize it.(same comment as in 5, argument not the answer alone is what is graded) [might need closed interval method]

7.) [10pts] basic limits at infinity

8.) [30pts] harder limits at infinity

9.) [10pts] wildcard.