Exam 3 Information

Exam #3 will be Friday, March 4. For the exam, you are responsible for the material in sections 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7 (plus the bit of 4.8 that we covered), and 4.10. You will also obviously need to use many skills from earlier sections in the text as a part of being able to do this material.

You will be permitted to use Maple for all parts of the exam. There will be items on the exam that are extremely difficult to complete by hand, so you really will need to use Maple.

Most of the kinds of things that you will be asked to do on the exam will be very similar to things that you had to do on the homework. Here is a brief summary of what we have done since the last exam, along with a few possible review problems for each topic:

- ❑ Section 4.1: Absolute max/min problems. On these problems, you should be able not only to compute the values, but you should also be able to explain clearly how we can be sure that an absolute max and min even exist and how we can be certain the values computed actually are the absolute max and min. Review problems: p. 309 #1-6
- ❑ Section 4.2: The mean value theorem. Determine whether the conditions of the MVT hold for a given function (like problems 11-14 on page 239). Be able to apply the MVT (like #15, 16, or 18 on p. 239).
- ❑ Sections 4.3 through 4.6 dealt primarily with graphing. I encourage you to use Maple for a problem like this on the exam. Use it to find the derivatives and to find all critical values. Estimate as accurately as possible all intervals of increase, decrease, concave up, and concave down by determining where the derivatives are positive and negative. Find all max, min, & inflection points; find horizontal, vertical, or slant asymptotes; and put it all together to draw the graph. There will certainly be at least one problem which involves all of this, and it will be worth A LOT of points. Review problems: p. 309 # 19, 23, 29, 31
- ❑ For the graphing, it is also possible that I will give you a question like #16 on p. 309 which gives a graph of the 1st derivative and asks you to determine from it information about the shape of the graph of the original function.
- ❑ Also from 4.4: compute limits at infinity or negative infinity. I expect to see the algebraic details of the computations, not just an answer (so you need to show me the steps like multiplying both top and bottom by something like $\frac{1}{x^3}$, etc.). Review problems: p. 308 # 7, 9, 10, 12
- ❑ Section 4.7: applied optimization problems. Review problems: p. 283-284 # 7, 11, 29, 33; p. 310 #47. Once you have set up the function for these problems, you are welcome to use Maple to find derivatives and critical values and to verify that a particular critical value is in fact the desired max or min. In the process, be sure that you (1) clearly specify the domain of the function, (2) find all critical values, (3) check endpoints of the domain if needed, and (4) clearly justify how you can be certain that a critical point that you find actually is the desired max or min.
- ❑ Section 4.10: find antiderivatives; projectile motion problems. Review problems: p. 310 # 53, 54, 55, 57, 61

You should also be able to do each of the following:

- ❑ State and explain the significance of the Extreme Value Theorem.
- ❑ State the Mean Value Theorem. Explain clearly two interpretations of the MVT. (One should involve tangent lines and the other should involve rates of change.)
- ❑ State the *definitions* of the terms "concave up" and "concave down". Explain in as much detail as possible *why* we use the 2nd derivative to determine when a function is concave up or down.
- ❑ If $f'(x)=g'(x)$ for all x in an interval $[a,b]$, prove that $f(x)=g(x)+C$ for some constant C.

This list is not intended to be a complete list of what will be on the exam. You are responsible for all of the material in the sections listed and should be able to do all of the homework problems from those sections.