Review for Exam 2

What follows is intended as a guide to focus your study for Exam 2. Read the Overview and the Study Tips. After that there is list of types of problems that you need to know how to do.

Overview

• Expect to see about ten (10) problems that look very much like homework problems.

• You will have 50 minutes for the exam, so, on average, you will have to work a problem every 5 minutes. In practice, some of the problems should go MUCH faster than that, so you have extra time for the harder stuff.

• Roughly 30% of the exam will be problems that are simply “find a derivative”. (These should go really fast.)

• The rest of the exam will consist of problems in which you must do something with a derivative. (This is the harder stuff.)

• In these problems, taking the derivative will be worth some partial credit, so you can expect that at least 50% of the total points available on the exam will come from the mechanical skill of taking a derivative.

• I will choose problems that are strongly suggestive of previous homework problems. I will NOT choose easy ones. I WILL chose problems that reflect both ungraded and graded homework. Be sure you have done ALL the homework.

• You WILL have a related rates problem (Section 3.9). It will count for more than 10% of your exam.

Study Tips

• Memorize the following derivatives.

\[
\begin{align*}
\frac{d}{dx} x^n &= nx^{n-1} \\
\frac{d}{dx} e^x &= e^x \\
\frac{d}{dx} \ln x &= \frac{1}{x} \\
\frac{d}{dx} \sin x &= \cos x \\
\frac{d}{dx} \cos x &= -\sin x \\
\frac{d}{dx} \tan x &= \sec^2 x \\
\frac{d}{dx} \cot x &= -\csc^2 x \\
\frac{d}{dx} \sec x &= \sec x \tan x \\
\frac{d}{dx} \csc x &= -\csc x \cot x 
\end{align*}
\]

• Know the product, quotient and chain rules. Recognize when and where each applies.
• Know the techniques of implicit and logarithmic differentiation. Recognize when and where they apply.

• Be able to differentiate any function that I can write down. This skill alone will account for at least 50% of the points on the exam.

• You can only acquire this skill by repetition. I suggest that you work problems 1–45 (odd) and 49-54 (all) on pages 228-229.

Problem Types. Here is a brief list of the things you have to know how to do with derivatives. (As always, you need to understand that “slope” and “rate of change” are really the same thing.)

1. Find slope at a point.

2. Find the equation of a tangent or a normal line.

3. Do something else with the tangent line or normal line once you find it.

4. Find where a graph has a certain slope (perhaps horizontal, perhaps not.)

5. Find where a curve has a tangent that meets some other constraint.

6. Compute higher derivatives.

7. Find velocity and/or acceleration.

8. Find when a certain velocity of acceleration occurs.

9. Unknown constant problems.

10. Abstract derivative problems. For example, ungraded homework for October 10, especially the Section 3.5 problems.

11. Any combination of the above

12. Anything similar to a graded homework problem.

13. Related Rates!