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. Then there are some final study tips.

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.
- Roughly one third of the exam will be problems that are simply “find a derivative”.
- The other two thirds of the exam will consist of problems in which you must do something with a derivative.
- In these problems, taking the derivative will be worth some partial credit, so you can expect that about 60% of the total points available on the exam will come from the mechanical skill of taking a derivative.
- I repeat: If you can take the derivative of any function I can write down, you should be able to get at least 60% on this exam.
- Be able to take derivatives quickly. That way you can accumulate 60% of the points quickly and spend more than 5 minutes per problem on the rest of the exam.
- I will choose problems that are strongly suggestive of previous homework problems, but don’t expect that I will choose easy ones.

Study Tips

- Memorize the following derivatives.

\[(x^r)' = rx^{r-1}\]
\[(e^x)' = e^x\]
\[(\sin x)' = \cos x\]
\[(\cos x)' = -\sin x\]
\[(\tan x)' = \sec^2 x\]
\[(\cot x)' = -\csc^2 x\]
\[(\sec x)' = \sec x \tan x\]
\[(\csc x)' = -\csc x \cot x\]
\[(\ln x)' = \frac{1}{x}\]
• 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 about 60% of the points on the exam.

• You can only acquire this skill by repetition. I suggest that you work problems 1–44 in the review section.

Problem Types

1. Find slope at a point.
   Solution: Take the derivative; plug in the point.

2. Find where a graph has a certain slope.
   Solution: Take the derivative; set equal to slope; solve.

3. Type 1 or 2, followed by some precalculus.
   Examples: Find a tangent line. Find a normal line. Find where a normal line crosses a curve.

4. Higher derivatives:
   Solution: Take the derivative; repeat as necessary; simplify if and when you like.

5. Related rates.
   Solution: Find an equation involving changing things; take implicit derivatives; plug in when.

6. Problems where you need to solve for unknown constants.
   Examples: Section 3.7, Problems 53–58.

7. Abstract and/or graphical problems.
   Examples: Review problems 67-79.

Further Study Tips

• Go through the Review problems 49-95 and identify which ones are which type. (Some are none-of-the above, but most you should recognize.)

• Go back through and work all the ones that you recognized.

• Note that problem types 1–5 can come in vastly different levels of complexity. Some things to watch for:
   1. The derivatives could be very complicated, or even implicit.
   2. You might have to solve some trig equations.
   3. You might have to solve non-linear systems of two equations.