Midterm 2 Review

- Do you know the standard differentiation rules? (sum, product, quotient, chain, etc)
- Do you know how to differentiate “standard” functions? (polynomials, sine, cosine, tangent, exponential, logarithm, arcsin, arccos, arctan, etc.)
- Do you know how to use both of the two definitions for derivatives? (one involves x --> a and one h --> 0)
- Do you know how to prove the product rule as done in lecture using both of the two aforementioned definitions of the derivative?
- Do you know how to prove the power rule as done in lecture and in homework using both definitions? (one method used long division of polynomials and the other used the binomial theorem)
- Do you know how to derive the derivative of arcsin (and cos and tangent) using the chain rule, knowing the derivative of sin, and a trig identity? (we did this in lecture)
- For that matter, if you know what the derivative of f(x) is, do you understand how to use the chain rule to find the derivative of f⁻¹(x)? (for example, find the derivative of logₐ(x) knowing the derivative of aˣ)
- Do you know how to use implicit differentiation to find the tangent line to a curve that you can’t write as a function? (for example, y³ + xy² + x³ = 0)
- Do you know what a “critical point” is? Can you solve for the critical points of a function? What is the largest number of critical points that a degree n polynomial could possibly have?
- Do you know what the relationship is between critical points and local/global maxima/minima?
- Can you come up with an example of a function that has a critical point, but has no local maximum or minimal?
- Do you know how tell if a critical point gives you a local minimum/maximum by looking at the first derivative” (it should change sign in some way)
- Do you know how to tell if a critical point gives you a local minimum or maximum by looking at the second derivative?

Can you provide an explicit example for all the concepts I’ve mentioned here? (i.e. can you write down a formula? also, can you draw a picture?) You should be able to write down some explicit ones for all the concepts without needing to look at the book!

Can you write down some random horrible bunch of functions full of products, compositions, chain rules, etc. and be confident that you know how to differentiate it given enough time? (I want you guys to be comfortable enough with differentiation that you know exactly what you would need to do and the only thing keeping you from doing it is your patience.)

Review the problems from webassign and the practice problems I have in the book, but try not to fall into the habit of just memorizing certain facts. The problems on the midterm may differ a little from anything you’ve seen, so you must be ready to think on your feet. Study together and explain the different concepts to each other (teaching others is the best way to learn...and asking others how to solve something lets you avoid any mistakes they made when learning...so it’s win win for both people). GOOD LUCK!