

Math 234

Review - Test 2

Like last time, I want to point out that this is *NOT* intended to be a complete study guide. You should consult Tim's lecture notes for a complete list of topics to be covered on the exam. This is just a list of some of the common mistakes made on the types of problems you might find on exam 2.

Implicit Differentiation

Add a $\frac{dy}{dx}$ whenever you take a derivative in terms of y .

Look for instances of the product rule - they're easy to miss.

Related Rates Word Problems

Steps to solve the problems: (1) Write down the important information; (2) Put it into math terms; (3) Find an equation you can differentiate with respect to time that will give you what you want; (4) Differentiate with respect to t ; (5) Plug the information you know into the equation, and solve for the quantity you wanted; (6) Answer the question.

Remember that you're going to be differentiating different variables with respect to time, so the chain rule says you'll need to add a $\frac{dx}{dt}$, or a $\frac{dA}{dt}$, or something like that (depending on your variables in the problem).

The Exponential Function e^x

Most of the important aspects of the function e^x are covered on the handout I gave you - if you don't have it anymore, it's available on Tim's website.

The Natural Logarithm

The key equations to remember when you're solving equations with $\ln x$ and e^x :

$$\ln(e^x) = x$$

$$e^{\ln x} = x$$

These give you a way to "get the variables out" when they're stuck someplace you don't want them to be. (Like in an exponent, or inside a natural log.)

Read something that looks like $\ln a = b$ as " e to the b th power is a ". So $\ln 1 = 0$ is saying (correctly) that e to the 0 power is 1.

REMEMBER that you ALWAYS have to take the natural log OF something. If you write something on your paper that looks like $\ln +3$ or $\frac{5}{\ln}$, PLEASE erase it!!!! You have made a mistake somewhere - "ln" by itself DOES NOT make sense.

Be careful: there is a difference between $\ln x^2$ and $(\ln x)^2$. For example, the two functions have very different derivatives:

$$\frac{d}{dx}(\ln x^2) = \frac{1}{x^2}(2x) = \frac{2x}{x^2} = \frac{2}{x}$$
$$\frac{d}{dx}[(\ln x)^2] = 2(\ln x)\left(\frac{1}{x}\right) = \frac{2}{x} \ln x$$

Exponential Growth and Decay

Remember: $f'(t) = kf(t)$ tells you that $f(t) = Ce^{kt}$, for some constant C . (Notice especially where the k is in each equation.)

The key equations to remember here are $P(t) = P_0e^{kt}$ (for populations, or other similar questions) and $A(t) = Pe^{rt}$ (for economic questions).

As in the related rates problems, the key is writing down the important information, and translating it into math terms.

Section 5.3

We'll go over this in discussion; also, consult Tim's lecture notes.

A Few Studying Hints

I would definitely expect to see a few questions asking you to take derivatives of functions with e^x and $\ln x$. Do a BUNCH of these types of questions for practice - they are not hard once you get used to them (honest). If you practice, you'll be able to do them quickly and correctly on the exam, and can get yourself some easy points while saving time for the harder questions. Look in the sections and in the chapter-end questions in your text for problems to practice; also, Tim has a link to supplementary exercises on his website. I wouldn't limit yourself to the questions that were assigned.

The word problems for this exam can be a little bit tricky. Make sure you can do all of the word problems Tim has assigned - if his test is like last time, it will have a variation of a homework question as a word problem. If you already know how to set it up, you're most of the way there.