

Information for the Final

Final: December 14, 2004, 6-8 PM

The final exam will consist of 150 points:

- **30 Points** is a review packet. I want you to take away from this class some product that synthesizes all that you have learned this semester. I want you to see how fundamental concepts are sequentially built upon to develop calculus, and how these concepts are used in real world applications.

As a result, I want you to make a review packet focusing on the following ideas from the semester. This review packet is of open length—I am looking for a quality job that shows me you understand how all these topics are interrelated. *Remember: I know this stuff, so it is more important that you do a quality job and take time to understand it rather than just copy from your notes!* By a quality job I mean mathematical correctness, neatness, and organization. It does not need to be typed. Below I have listed topics that we covered in class, and a successful packet would address these topics. This is due at the beginning of class the day of the final. I want you to make a copy of your work and hand in the original to me so that you can retain a copy.

– **Limits**

- What is a limit?
- How is it defined?
- How would you describe the idea of a limit in non- mathematical terms?
- What are some techniques for evaluating limits?
- What are algebraic properties of limits?
- How do you evaluate limits for piecewise functions? rational functions? polynomial functions?
- Why are limits important? Why are they the foundation for some of the other ideas of calculus?
(You could also discuss limits in the other concepts as well.)

– **Continuity**

- What does it mean for a function to be continuous at a point $x = c$?
- How would you describe continuity in non-mathematical terms?
- How does the definition of continuity relate to limits?
- What functions are continuous everywhere? Which functions are not?

– **Derivatives**

- What is a derivative? How is defined mathematically?
- What are some mathematical notations that represent the derivative?
- What does the derivative represent? Why is it important?
- How do differentiability and continuity relate to each other?
- What are algebraic properties of derivatives? From what fundamental concept can these properties be derived?
- How are derivatives calculated in practice? (What rules/formulas do you use?)
- How do you find higher-order derivatives? Do they have any use?
- How do you differentiate a function implicitly? Why is it important?
- How do you differentiate multivariable functions? What are some mathematical notations that represent partial derivatives?
- What unique fact emerges when you find mixed partial order derivatives?

– **Applications of the Derivative**

- What does it mean to maximize a function? What are some tests you can use to determine if a function is maximized (or minimized) at a point?
- What information is found in the first and second derivatives of a function?
- How do you sketch a graph of a function using information about derivatives?
- What are some business/economic applications where derivatives are used?

– **Integrals**

- What is a definite integral? How is it defined?
- What previous concepts are used to define a definite integral and why are they important?
- What does the definite integral represent?
- What is an indefinite integral? How does it relate to antidifferentiation?
- How is the definite integral different from an indefinite integral?
- What does the Fundamental Theorem of Calculus tell us? How does it unify all the previous concepts we have studied?
- What are some algebraic properties of integrals?
- What are some formulas you use to evaluate integrals?
- What is a differential equation?
- How do you solve a separable differential equation? How does integration relate to differential equations?
- How do you evaluate an improper integral?

– **Applications of Integrals**

- How do you use integrals to find the area between functions?
- How do you use integrals in business/economic applications?
- How do you use improper integrals in business/economic applications?
- What is consumer's surplus? How would you define it in non-mathematical terms?
- What is producer's surplus? How would you define it in non-mathematical terms?
- What is mathematical bioeconomics?

Note that creating this packet will help you review as well-for each of these items an example can be done, and it is encouraged you give sample problems in your packet.

- **30 Points** will be on material covered since Exam III. This includes Sections 13.7, 14.1-3, and bioeconomics. In particular I expect you to be able to do the following:
 - Evaluate improper integrals, which includes evaluating integrals from a to ∞ , $-\infty$ to b , or $-\infty$ to ∞ .
 - Find partial derivatives of multivariable functions.
 - Understand the Cobb-Douglas production function and what it represents, its properties, and using partial differentiation to analyze it as discussed in class.
 - Find equilibrium (stationary) points for a system of differential equations (bioeconomics) and interpret resource exploitation.
- **90 Points** will be comprehensive material covered in the course. The information in past review sheets should be a good roadmap for your studying. It is recommended that you review and correct your errors on previous exams.