

This is a list of what I consider the basic skills of this course. With the exception of the True/False questions, the skills on this list should be enough to get a perfect score on the final, assuming that you are able to consistently perform them at a high level. The True/False questions will be broader and more conceptual, including some material from lecture that is not in the book. But you should think of the True/False questions as extra credit—the core skills below are where you should focus to achieve the largest impact on your grade.

In order to have an effective grasp of the material below, you will need to be well-practiced with this course's prerequisites, notably differential calculus and elementary algebra. In particular, to be assured of a high grade you will need to have a complete mastery of basic algebraic manipulation and the calculation of derivatives using the product rule, the chain rule, and the quotient rule.

There is not so much time left to study. To use your time effectively, I have the following tips:

- Study with others. They know things you don't, and vice-versa.
- Focus on skills where you have difficulty; do not waste time re-learning skills you are already confident with. You will get the most mileage when studying if you study your own mistakes.
- Don't be afraid to spend a large amount of time on a single skill. It is probably better to learn one skill at 100%, than to learn five skills at 20%, because it will stick with you longer and be more reliable.
- The standard is to solve problems correctly, *not* to “know what is going on” but be unable to work things out mathematically.
- By the same token, if you get a wrong answer on a practice problem, do the problem over until you get the correct answer. Do not get in the habit of speeding through problems with mostly wrong answers.
- If you have test anxiety, you may want to practice solving problems on your own under test conditions. Just prepare a few problems, set a timer, and pretend that your work will be graded (or get a friend to actually grade it!). The test itself will feel more like a normal day if you spend some time convincing your body that tests are a normal thing.
- Make sure that you are well-rested and well-fed on the day of the exam, even if that means studying a little less. There is no point in lowering your IQ by 25% in order to increase your knowledge of the subject by 1%.

Chapter 7: Functions of Several Variables

- Understand the meaning of partial derivatives, and know how to calculate them for functions of several variables.
- Use partial derivatives to find critical points (candidate local extrema) of functions of several variables.
- Use the second derivative test to identify whether a critical point is a local extremum.
- Use Lagrange multipliers to calculate critical points of functions subject to a constraint.
- Understand the meaning of double integrals, and know how to evaluate them as iterated integrals.

Chapter 8: Trigonometric Functions

- Know what a radian is.
- Know the definitions of $\sin t$ and $\cos t$ in terms of the unit circle.

- Know the derivatives of $\sin t$ and $\cos t$, and have at least some understanding of where these derivatives come from.
- Know the definitions of the functions \tan , \cot , \sec , \csc in terms of \sin and \cos . Use standard rules of differentiation to compute their derivatives.

Chapter 9: Integration Techniques

- Understand u -substitution using the chain rule. Be able to recognize integrals that are greatly simplified by substitution.
- Understand integration by parts using the product rule. Be able to determine whether integration by parts is appropriate for a given integral, and be able to do it correctly.
- Given an indefinite integral, be able to decide which of substitution or integration by parts is the more effective method.
- Understand the above techniques for definite integrals.
- Know the definition of improper integrals in terms of limits, and be able to evaluate them correctly (i.e. without plugging ∞ into things as if it were a number).

Chapter 10: Differential Equations

- Know what a differential equation is. Know basic terminology, like “order”, “initial value”, etc.
- Have a grasp of how to translate English descriptions into differential equations, and vice-versa.
- Know how to plug a function into a differential equation to determine if it is a solution.
- Understand the technique of separation of variables, and be proficient with using it.
- Know how to use an integrating factor to solve a general first-order linear differential equation.

Chapter 11: Taylor Polynomials and Infinite Series

- Understand and be able to read Σ notation.
- Know the definition of a Taylor polynomial, and have at least some understanding of why they are defined that way.
- Know the meaning of the expression $\sum_{k=1}^{\infty} a_k$ as a limit. Know what it means for a series to be convergent or divergent.
- Know everything there is to know about geometric series: what they are, how to compute them, when they converge or diverge, etc.
- For series with non-negative terms, know the comparison test and integral test, and be able to use both effectively, sometimes together.
- For both tests, understand fully the assumptions that allow you to use them.
- Know what a Taylor series is.
- Get proficient with some of the basic manipulations of Taylor series, such as substitution, term-by-term differentiation, addition of series, etc.

Chapter 12: Probability and Calculus

- Know what a discrete random variable is, and how to compute its expected value, variance, and standard deviation.
- Know what a continuous random variable is, and how to compute its expected value, variance, and standard deviation.
- Understand the relationship between random variables and probability distributions.
- Know the cumulative distribution.
- Know how to interpret English descriptions in terms of probabilities, and vice-versa.