

FINAL OVERVIEW AND REVIEW

This Final Overview and Review serves three purposes:

- To provide an overview of the format of the Final.
- To provide a detailed list of topics you are expected to know for the Final and can expect to be tested on.
- To provide some practice problems to aid your studying.

Exam Format

- (I) Unless otherwise arranged, you have three hours to complete the exam.
- (II) Calculators are **not permitted** for use during the exam.
- (III) The exam is **closed book**: notes, textbooks, computers, mobile devices, listening devices are **not permitted** for use during the exam.
- (IV) There will be a total of five problems on the exam. To receive full credit you will need to provide correct and complete solutions to all seven problems.
- (V) There will be one problem consisting of several True/False subproblems.
- (VI) There will be one short-answer problem consisting of several short, computational subproblems.
- (VII) There will be three long-answer problems. Each long-answer problem may have multiple parts.
- (VIII) A student with a solid grasp of the material and excellent problem-solving ability should be able to complete the exam in < 1 hours.

Outline of Topics to Know

Theory

You should know all definitions/concepts from lecture (and used in homework) precisely. You should know the definitions of the following terms/concepts and how they are used:

- (a) Sigma notation $\sum_{i=1}^n a_i$
- (b) The definition and construction of the definite integral using left-/right-hand sums.
- (c) The geometric interpretation of the definite integral as an area.
- (d) The notion of an antiderivative.
- (e) The First Fundamental Theorem of Calculus.
- (f) The indefinite integral.
- (g) The notion of an integral function.

(h) The Second Fundamental Theorem of Calculus.

(i) The method of u -substitution.

(j) The method of integration by parts.

Major Results

You should thoroughly understand all of the major results we've discussed this semester; this includes all of the theorems and propositions we've discussed in class. This means, in particular, having a solid understanding of each theorem's hypothesis and, if I have discussed the necessity of a certain hypotheses, you should understand why. Here are some of the big results we've discussed so far.

- (i) You should know the relationship between the definite integral of a function and Riemann sums.
- (ii) You should know how to apply the First Fundamental Theorem of Calculus to compute definite integrals.
- (iii) You should know the relationship between the Second Fundamental Theorem of Calculus and the existence of antiderivatives.
- (iv) You should know the basic properties of definite integrals.
- (v) You should know the basic properties of indefinite integrals.
- (vi) You should know that antiderivatives are non-unique.

Computation

In general, you should know how to work problems connected to each key concept discussed in the previous section. As I said before, if you understand all of the lecture material and all of the homework (both the "turn in" and "do not turn in" problems), are able to work quickly and efficiently, you should perform well on the exam. Here is an incomplete list of things we have done so far this semester:

1. You should know how to compute a definite integral using left-/right-hand sums.
2. You should know how to compute definite integrals using the First Fundamental Theorem of Calculus.
3. You should know how to find antiderivatives of polynomial functions, exponential functions and certain trigonometric functions.
4. You should know how to find antiderivatives using the method of u -substitution.
5. You should know how to find antiderivatives using the method of integration by parts.
6. You should know how to find the derivative of an integral function.
7. You should know how to use u -substitution to compute definite integrals.
8. You should know how to use integration by parts to compute definite integrals

Review Problems

The following problems will provide you with good practice for the midterm. You should also attempt the *Do not turn in* problems from homework. If you want more problems then please feel free to ask.

Section 6 Summary (p.345) 6-27, 30-35, 55-67, 73-76

Chapter 7 Summary (p.408) 1-53, 57-70, 111-117, 119-121, 124, 158-162, 173-177