

General Points:

- There is just one fundamental way to prepare for an exam. Understand the material!
- You'll answer questions on the exam itself. All you need to bring is a writing utensil.
- When you receive the exam, **relax** and proceed deliberately. If you don't know how to do a problem, skip it and return to it later. Accuracy is paramount, speed is useless!
- Check your answers.
- During the exam, **all books, notes, and electronic devices must be out of sight.**

Exam topics: Chapter 7 (homeworks 5-7)7.1: Integration by parts

1. Know how to evaluate definite and indefinite integrals using integration by parts.
2. Pay special attention to the technique of evaluating integrals like $\int e^x \cos x dx$ (see also problems 21-24 from this section).
3. You should also know how the formulas for computing the volume of a plane region revolved about the x or y axis that we studied in the previous chapter as well as the formulas for computing the length of a plane curve.

7.2: Trigonometric integrals

1. Know the following trigonometric identities:

$$\begin{aligned}\cos^2 x + \sin^2 x &= 1, \\ \sin^2 x &= \frac{1 - \cos 2x}{2}, \\ \cos^2 x &= \frac{1 + \cos 2x}{2},\end{aligned}$$

and how to apply them to reduce integrals like $\int \sin^m x \cos^n x dx$ and $\int \sqrt{1 \pm \cos kx} dx$ to "easy" integrals.

2. Know the following trigonometric identities:

$$\begin{aligned}\sec^2 x - \tan^2 x &= 1, \\ \csc^2 x - \cot^2 x &= 1,\end{aligned}$$

and how to apply them to reduce integrals involving powers of $\tan x$, $\sec x$, $\cot x$, and $\csc x$.

3. Know how to combine the above formulas with u -substitutions and integration by parts to evaluate difficult integrals.

7.3: Trigonometric substitution

1. Know the three reference triangles given in Figure 7.2 for the basic substitutions for integrals that involve $\sqrt{a^2 - x^2}$, $\sqrt{a^2 + x^2}$, and $\sqrt{x^2 - a^2}$
2. Know how to combine these substitutions with the trigonometric identities listed above.

7.4: Partial fractions

1. You should definitely know how to rewrite a rational function as the sum of simpler rational functions using *partial fractions*. See the summary given at the bottom of p. 465 and top of p. 466.
2. You should also recall how to divide polynomials and then use partial fraction on the remainder term.
3. Once a partial fraction has been computed, you should then know how to integrate the result.

7.5: Integral tables and computer algebra systems

1. I may give you some general integral formulas and then ask you to use those formulas to compute a specific integral.

7.6: Numerical integration

1. Know the formulas for Trapezoidal and Simpson's rules and how to use them to estimate the value of a definite integral.
2. Know the formulas for estimating the error in the Trapezoidal and Simpson's rules.
3. Know how to use this formula to estimate the number of subinterval n it would take to guarantee the error in the Trapezoidal or Simpson's rule approximation is less than a specified tolerance.

7.7: Improper integrals

1. Know how to compute both improper integrals of type I (infinite integration interval) and type II (integrand with a vertical asymptote).
2. These could be combined with any of the integration techniques from sections 7.1–7.5.
3. I will not ask you about how to test for convergence or divergence of improper integrals since we were not able to adequately cover this topic before the exam.