Review homework, quizzes, examples from book and lecture examples. Do practice problems and at least a couple of sample midterms. Have all needed formulas and trigonometric functions special values in your notes.

§6.2 Volumes by disks/washers:

- Understand Disks and Washers: general formula

$$V = \int_a^b \pi R^2 \, dx \text{ (Disks)} \quad V = \int_a^b \pi R^2 - \pi r^2 \, dx \text{ (Washers)} .$$

- How to slice and in which variable to integrate, depending on the situation.
- How to compute R (and r if necessary) in terms of the variable of integration.

§6.3 Volumes by shells:

- When to use?
- Understand the general formula $V = \int_a^b 2\pi rh \, dx$
- How to slice and in which variable to integrate, depending on the situation.
- How to compute r and h in terms of the variable of integration.

§6.4 Work:

- Be able to set up and solve problems of all types described in class
- Understand how to use Riemann sums to set up the integrals
- Spring problems, tank problems, chain problems

§6.5 Average value of a function:

- Know and be able to apply the formula to find the average value of a continuous function $f(x)$ over an interval $[a, b]$
- Understand how it relates to area under curve

METHODS OF INTEGRATION §7.1-7.5: Know how and when to apply each of these. Do lots of practice problems: examples in book, from class, homework (especially week 6 homework hand-out), exercises at the end of chapter (page 541), or from sample midterms.

7.1 Integration by Parts

7.2 Trig Integrals

- sin / cos : trig formulas and strategies for solving integrals
- sec / tan: trig formulas and strategies for solving integrals
- Have the integrals of tan and sec on your list of formulas.

7.3 Trig Substitution

- Three main patterns: be familiar with them and when to apply each

- Completing the square: when is it necessary? How to do it?

7.4 Partial Fractions

- Understand the method and when it applies.
- Be able to do polynomial division, and to factor the denominator
- How to break down into partial fractions: repeated versus non-repeated factors and linear versus quadratic factors
- Sometimes you need to do a substitution first, then PF

7.5 Strategy for Integration: how to choose an optimal method. Guidelines + practice, practice, practice.

7.7 Approximating Integrals

- Know and be able to apply correctly the Midpoint Rule, Trapezoidal Rule and Simpson's Rule
- Problems can involve a function or a table of data; Sometimes can be combined with a work/volume/etc problem.

Integration formulas that you can use

1. Power Rule $\int x^n \, dx = \dfrac{x^{n+1}}{n+1} + C$, $n \neq -1$
2. $\displaystyle\int \frac{1}{x} \, dx = \ln|x| + C$
3. $\displaystyle\int e^x \, dx = e^x + C$
4. $\displaystyle\int \sin x \, dx = -\cos x + C$, $\displaystyle\int \cos x \, dx = \sin x + C$
5. $\displaystyle\int \sec^2 x \, dx = \tan x + C$, $\displaystyle\int \sec x \tan x \, dx = \sec x + C$
6. $\displaystyle\int \tan x \, dx = \ln|\sec x| + C$, $\displaystyle\int \sec x \, dx = \ln|\tan x + \sec x| + C$
   $\displaystyle\int \cot x \, dx = -\ln|\csc x| + C$, $\displaystyle\int \csc x \, dx = \ln|\csc x - \cot x| + C$
7. $\displaystyle\int \ln x \, dx = x \ln x - x + C$
8. $\displaystyle\int \frac{1}{x^2 + a^2} \, dx = \frac{1}{a} \arctan\left(\frac{x}{a}\right) + C$, $\displaystyle\int \frac{1}{\sqrt{a^2 - x^2}} \, dx = \arcsin\left(\frac{x}{a}\right) + C$

Anything else: must show work!