Week 15 — Semester Overview

MATH:114, Recitations 309 and 310

Midterm 1

1. How can we use integrals to find the *area between two curves*? How can we use geometry to estimate these calculations?

2. Describe how the *shell* and *washer* methods work for finding volumes of solids of rotation. What geometric ideas are at play?

3. Describe the ideas behind computing *curve lengths* and *surface* areas of solids of rotation. How are these related, if at all, to the shell and washer methods?

4. What does *Euler's formula* tell us?

Midterm 2

5. Talk about the "information" included in *linear* and *quadratic* approximations. How are these approximations related to *Taylor polynomials*?

6. Why do we use *trigonometric substitutions* when integrating? What theorems and identities make these substitutions work?

7. What is *integration by parts*? How does it work?

8. What makes *partial fraction decomposition* a useful tool?

9. Why do we use *improper integrals*? Equivalently, what problem does an improper integral help us avoid?

10. Discuss the ideas behind the three *numerical integration* techniques: the *midpoint rule*, the *trapezoid rule*, and *Simpson's rule*.

11. What does it mean for an improper integral to *converge* or *diverge*? What techniques can we use to tell whether an improper integral converges or diverges?

Midterm 3

12. What is a *sequence*? What does it mean for a sequence to *converge*? Can you express this idea mathematically?

13. What is a *series*? What is the relationship between series and sequences? If a series converges, what can we say about its underlying sequence, and its sequence of partial sums?

14. What tests can we use to determine whether a series converges or diverges? *Why* do they work?