8/23  
**Section:** 4.4  
**Agenda:** Introduction. Riemann sums and the definite integral.

8/24  
**Section:** 4.4  
**Agenda:** The definite integral. Area and signed area. Calculation and approximation of definite integrals by Riemann sums. Properties of the definite integral.  
**Assignment:** Read examples 4.2, 4.4 and 4.6. Do problems 13-25 odd.

8/25  
**Section:** 4.4  
**Agenda:** Properties of the definite integral. The Integral Mean Value Theorem.  
**Assignment:** Do problems 31-37 odd, 49 and 51.  
**Summary:** Partitions and evaluation points. The definition of the definite integral as the limit of Riemann sums. Approximation of a definite integral by a Riemann sum with large $n$. Evaluation of a definite integral by taking the limit as $n \to \infty$ in a Riemann sum. The definite integral as area or signed area. Properties of the definite integral. The average value of a function. The Integral Mean Value Theorem.

8/26  
**Section:** 4.5  
**Agenda:** The Fundamental Theorem.  
**Assignment:** Do problems 5-15 odd.  
**Notes:** We’ll have a quiz over 4.5 and 4.6 on Wednesday, 9/1.

8/27  
**Section:** 4.5  
**Agenda:** The Fundamental Theorem.  
**Assignment:** Do problems 17-23 odd, 41-51 odd, 71 and 77. Read examples 5.1-5.7, 5.9 and 5.12.  
**Summary:** The statements and proofs of both parts of the Fundamental Theorem. Evaluation of indefinite integrals and differentiation of integrals with variable limits of integration.

8/30  
**Section:** 4.6  
**Agenda:** Recitation. Integration by substitution.  
**Assignment:** In 4.6, do 5-15 odd, 47-51 odd, 67 and 69.  
**Words:** kibbitz, quincunx
8/31  Section: 4.7
   Agenda: Numerical Integration. The midpoint and trapezoid rules.

9/1   Section: 4.7
   Assignment: Read examples 7.1-7.6 and 7.8. Do problems 7, 9, 13, 17, 31. In 13 and 17, you need only do the calculation with \( n = 10 \).
   Summary: Use of the midpoint, trapezoid and Simpson rules. The trapezoid rule approximates the integrand \( f \) over \([x_{i-1}, x_i]\) with a linear function that agrees with \( f \) at \( x_{i-1} \) and \( x_i \). It returns the average of the left and right hand Riemann sums. Simpson’s rule approximates the integrand \( f \) over \([x_{i-2}, x_i]\) with a quadratic function that agrees with \( f \) at \( x_{i-2}, x_{i-1} \) and \( x_i \).

9/2   Sections: 5.1, 5.2
   Agenda: Areas and volumes.
   Assignment: In 5.1, read examples 1.4 and 1.5, and do problems 5 and 29.

9/3   Section: 5.2
   Agenda: Volumes by disks and washers.
   Assignment: In 5.2, read examples 2.2 and 2.5. Do problems 9, 11, 17, 21, 23 and 31.
   Review: In 4.5, do problems 55 and 57.
   Notes: We’ll have quiz over 5.2 on Wednesday, 9/8.
   Summary: The derivation and use of integrals to compute volumes. The method of disks and, in the presence of cavities, the method of washers.

9/7   Section: 5.3
   Assignment: In 5.3, read examples 3.1-3.3. Do problems 13-17 odd.
   Notes: We’ll have quiz over 5.2 on Wednesday, 9/8.
   Summary: The derivation and use of integrals to compute volumes by the shell method.

9/8   Section: 5.5
   Agenda: Quiz #2. Projectile motion.
   Assignment: In 5.5, do problems 7, 15, 25, 27 and 35.

9/9   Section: 5.6
   Agenda: Loops in Maple. Work.
   Assignment: In 5.6, read examples 6.1-6.3. Do problems 7-19 odd.
   Review: In 4-R, do problems 45-55 odd.
9/10  Section: 5.6  
Agenda: Impulse and hydrostatic force and pressure.
Assignment: In 5.6, do problems 37, 39 and 41.
Review: In 4-R, do problems 57, 59 and 61.
Summary: The derivation and use of integrals to compute work and hydrostatic force.

9/13  Section: 5.7  
Agenda: Introduction to probability. Random variables, histograms.
Notes: We’ll have an exam over chapters 4 and 5 on Monday, 9/20.

9/14  Section: 5.7  
Assignment: In 5.7, read examples 7.1-7.5, and do problems 9, 13, 19, 25, 31-37 odd.
Summary: Use of pdf’s to compute probabilities, means and medians for continuous random variables.

9/15  Agenda: Review.
Notes: We’ll have an exam over chapters 4 and 5 on Monday, 9/20.

9/16  Section: 6.2  
Agenda: Inverse functions. One-to-one functions and the horizontal line test. Solving for inverses. The graph and derivative of an inverse function.
Assignment: In 6.2, read examples 2.3, 2.5, 2.7 and 2.9. Do problems 19-27 odd.
Review: In 5-R, do problems 7, 11, 13 and 15.

9/17  Section: 6.7  
Agenda: The inverse trigonometric functions. Simplification of expressions involving trigonometric and inverse trigonometric functions.
Assignment: In 6.7, do problems 5-23 odd.
Review: In 5-R, do problems 27, 33, 37, 38, 45 and 47.
Words: widdershins, deasil, floccinaucinihilipilification

9/20  Agenda: Exam 1.

9/21  Sections: 6.8, 6.9  
Agenda: The calculus of inverse trigonometric functions. The hyperbolic functions.
Assignment: In 6.8, read example 8.4 and do problems 5, 9 and 17-25 odd. In 6.9, read examples 9.1 and 9.2, and do problems 25-29 odd.
9/22  Section: 7.2  
Agenda: Integration by parts.
Assignment: In 7.2, do problems 7-13 odd, 19-23 odd, 41 and 43.

9/23  Section: 7.3  
Agenda: Trigonometric techniques of integration.
Assignment: In 7.3, read examples 3.6-3.8 and 3,10. Do problems 3, 5, 13, 27, 35 and 51.
Summary: Integrands of the form \( \sin^m x \cdot \cos^n x \) where \( n \) or \( m \) is an odd, positive integer. Use of the half angle formulas for integrands involving even powers of \( \sin \) and \( \cos \). Integrands involving sec and tan. The substitutions \( x = a \sin \theta \), \( x = a \tan \theta \) and \( x = a \sec \theta \) for integrands involving \( \sqrt{a^2 - x^2} \), \( a^2 + x^2 \) and \( \sqrt{x^2 - a^2} \) respectively.
Words: duniewassal

9/24  Section: 7.4  
Agenda: Partial fraction decomposition: Linear factors.
Notes: There will be a quiz on Wednesday, 9/29, over 7.3.

9/27  Section: 7.4  
Agenda: Partial fraction decomposition: Quadratic factors. Completing the square in an integrand.)
Assignment: In 7.4, do 3-13 odd.
Summary: Partial fraction decomposition (PFD) of a rational function

\[
f(x) = \frac{P(x)}{Q(x)},
\]

where the degree of \( Q \) exceeds that of \( P \). (If this is not the case, use long division.) If \( Q(x) \) has a factor of the form \( (ax + b)^n \), the sum

\[
\frac{c_1}{ax + b} + \cdots + \frac{c_n}{(ax + b)^n},
\]

appears in the PFD. If \( Q(x) \) has an irreducible \( (b^2 - 4ac < 0) \) quadratic factor \( ax^2 + bx + c \), then a term of the form

\[
\frac{Ax + B}{ax^2 + bx + c},
\]

appears in the PFD.
Section: 7.6
Agenda: L'Hôpital’s rule and indeterminate forms.
Assignment: In 7.6, read examples 6.5, 6.9 and 6.10. Do problems 7-17 odd.
Notes: There will be a quiz on Wednesday, 9/29, over 7.3.
Summary: For limit forms \( \frac{0}{0} \) and \( \frac{\infty}{\infty} \), apply L'Hôpital’s rule until the form of the limit is no longer indeterminate. If the limit has the form \( 0 \cdot \infty \) or \( \infty - \infty \), rewrite it as \( \frac{0}{0} \) or \( \frac{\infty}{\infty} \), and then apply L'Hôpital’s rule. For limits of the types \( 1^\infty \), \( 0^\infty \), \( 0^0 \) or \( \infty^0 \), take the natural log, apply L'Hôpital’s rule (if appropriate), and then exponentiate (to cancel the log).

Section: 7.7
Agenda: Quiz #3. Introduction to improper integrals.

Section: 7.7
Agenda: Improper integrals: Continuous integrands over infinite domains. Applications to probability. Writing assignment #1.
Review: In 7.6, do problems 19-25 odd.
Notes: Writing assignment #1 is due on Friday, 10/8.
Words: antediluvian, prelapsarian

Section: 7.7
Agenda: Improper integrals: Unbounded integrands over finite and infinite domains. The comparison test.
Assignment: In 7.7, read examples 7.1-7.5. Do problems 3-21 odd and 51-59 odd.

Section: 8.1
Assignment: In 8.1, do problems 15-33 odd and 59.
Review: In 7-R, do problems 1-5.

Section: 8.1
Assignment: In 8.1, do problems 35-49 odd.
Review: In 7-R, do problems 6-10.
Notes: We’ll have exam #2 on Wednesday, 10/13. The exam will cover the material from chapters 6 and 7.
10/6  Section: 8.2  
   Assignment: In 8.2 read theorem 2.3 and do problems 5-15 odd.  
   Review: In 7-R, do problems 11-15, 45 and 46.  

10/7  Section: 8.3  
   Agenda: Infinite series. The integral and comparison tests. The p-series. The divergence of the harmonic series.  
   Assignment: In 8.3, do problems 5-15 odd.  
   Notes: We’ll have exam #2 on Wednesday, 10/13. The exam will cover the material from chapters 6 and 7.  

10/8  Section: 8.3  
   Agenda: Infinite series. The comparison and limit comparison tests.  
   Assignment: In 8.3, do problems 17-31 odd.  
   Review: In 7-R, do problems 26-35.  

10/11  Agenda: Review.  

10/12  Sections: 8.4, 8.5.  
   Notes: We’ll have exam #2 tomorrow.  

10/13  Agenda: Exam 2.  

10/14  Section: 8.5  
   Agenda: Conditional and absolute convergence. The ratio and root tests.  
   Assignment: In 8.4, do problems 5-15 odd. In 8.5, do 5-17 odd and read the proof of theorem 5.1.  
   Summary: For a summary of convergence tests, see page 672 of the text.  

10/15  Section: 8.6  
   Agenda: Introduction to power series. Radius and interval of convergence.  

10/20  Section: 8.6  
   Agenda: Behavior of power series. Convergence, term-by-term differentiation and integration. Derivation of power series for \((1 + x)^{-1}\) and \(\ln(1 + x)\).  
   Assignment: In 8.6, do problems 21-37 odd.
10/21  Section: 8.6  
**Agenda:** Review. Differentiation and integration of power series. Derivation of power series for \((1 + x^2)^{-1}\) and \(\arctan x\).

**Assignment:** In 8.6, do problems 5-19 odd and 39-45 odd.

**Summary:** Let \(r\) be the radius of convergence of the power series
\[
\sum_{k=0}^{\infty} b_k(x - c)^k.
\]

Either \(r = 0\), and the series converges only at \(x = c\), \(r = \infty\) and the series converges absolutely for all \(x\), or \(0 < r < \infty\) and the series converges absolutely for \(|x - c| < r\) and diverges for \(|x - c| > r\). In this last case, the endpoints \(x = c \pm r\) have to be tested separately for convergence. You can differentiate and integrate power series term-by-term. The new series will have the same radius of convergence as the old, though the endpoint behavior might change. (Once again, you have to test the endpoints separately.)

10/22  Section: 8.7  
**Agenda:** Introduction to Taylor series.

**Review:** In 8.5, do problems 19-27 odd.

**Notes:** We’ll have a quiz over 8.7 on Wednesday, 10/27.

10/25  Section: 8.7  
**Agenda:** Taylor series for \(e^x\), \(\sin x\) and \(\cos x\) about \(c = 0\). The Taylor series for \(\ln x\) about \(c = 1\).

**Assignment:** In 8.7, do problems 7-27 odd.

**Notes:** We’ll have a quiz over 8.7 on Wednesday, 10/27.

10/26  Section: 8.7  
**Agenda:** Calculation of Taylor series. New series from old. Taylor polynomials.

**Notes:** We’ll have a quiz over 8.7 on Wednesday, 10/27.

**Words:** boustrophedon, boustrophedonically

10/27  Section: 8.7  
**Agenda:** Quiz #4. Approximation by Taylor polynomials.
10/28  
**Section:** 8.7  
**Agenda:** Approximation by Taylor polynomials. Taylor’s theorem as an extension of the mean value theorem. Using Taylor’s theorem to obtain approximations of prescribed accuracy.  
**Assignment:** In section 8.7, do 33-51 odd.

10/29  
**Section:** 8.7  
**Agenda:** Review. Using Taylor’s theorem to obtain approximations of prescribed accuracy.

11/1  
**Section:** 8.7  
**Agenda:** Review.  
**Notes:** We’ll have exam #3 on Monday, 11/8.

11/2  
**Sections:** 8.7, 8.8  
**Agenda:** Review. Applications of Taylor series. The Coates-Euler formula. Approximation of definite integrals.  
**Assignment:** In section 8.8, read examples 8.1-8.3 and do problems 5, 11, 19, 23, 27 and 37.

11/3  
**Section:** 8.8  
**Agenda:** Applications of Taylor series. Approximation of definite integrals.  
**Review:** In 8-R, do 19-21, 25 and 27.  
**Notes:** We’ll have exam #3 on Monday, 11/8. The exam will cover the material from chapter 8.  
**Words:** pleonasm

11/4  
**Section:** 8.8  
**Agenda:** Applications of Taylor series. Computation of limits, series representation of Bessel functions, approximation of functions in physics.  
**Assignment:** In 8.8 do problems 7, 13, 21, 29.  
**Review:** In 8-R, do 22, 29-37 odd, 45 and 47.

11/5  
**Section:** 8.8  
**Agenda:** Review. Applications of Taylor series. Approximation of functions in physics.  
**Review:** In 8-R, do 39-43 odd, 49, 53-75 odd.

11/8  
**Agenda:** Exam #3.
11/9  **Section:** 8.9  
**Agenda:** Introduction to Fourier series. Trigonometric polynomial approximation of $2\pi$-periodic functions. “Good” convergence for smooth functions.

11/10  **Section:** 8.9  
**Agenda:** Fourier series. The Euler-Fourier formulas. Calculation of Fourier coefficients for $2\pi$-periodic functions.  
**Assignment:** In 8.9 read examples 9.1 and 9.2 and do problems 5-11 odd.

11/11  **Section:** 8.9  
**Agenda:** Fourier series for $2L$-periodic functions. Convergence of Fourier series. The Dirchlet-Jordan theorem.  
**Assignment:** In 8.9 read examples 9.1 and 9.2 and do problems 5-11 odd.

11/12  **Section:** 8.9  
**Agenda:** Review of exam #3. Odd and even functions and the calculation of Fourier coefficients. Using Fourier series to sum numerical series.  
**Assignment:** In 8.9 read example 9.3 and do problems 13-17 odd, 25 and 30-35.  
**Notes:** We’ll have a quiz on 8.9 on Wednesday, 11/17.

11/15  **Section:** 8.9  
**Agenda:** Review of exam #3. Parseval’s identity. Root-mean-square convergence of Fourier series.

11/16  **Section:** 9.1  

11/17  **Section:** 9.1  
**Agenda:** Quiz #5. Parametric equations of circles. ellipses and straight lines.  
**Assignment:** In 9.1 do problems 5-21 odd, 35-37 odd, 43-47 odd, 61 and 62.  
**Words:** hebetude

11/18  **Section:** 9.2  
**Agenda:** Calculus of parametric equations.
11/19  **Sections:** 9.2, 9.3  
**Agenda:** Tangent lines to curves defined parametrically. Speed and arclength.  
**Assignment:** In 9.2, do problems 5, 7, 13, 17, 21, 23, 43 and 44. In 9.3, read example 3.3 and do problems 5 and 7.  
**Notes:** We’ll have a quiz over 9.1 and 9.2 on Tuesday, 11/23.

11/22  **Section:** 9.3  
**Agenda:** Arclength of a parametric curve and the surface area of a solid of revolution.  
**Assignment:** In 9.3, do problems 5, 7, 27 and 29.

11/23  **Sections:** 9.3, 9.4  
**Agenda:** Quiz #6. The brachistochrone problem. Polar coordinates.

11/29  **Sections:** 7.2, 7.4  
**Agenda:** Review of techniques of integration. Integration by parts. Partial fraction decomposition.  
**Review:** In 7-R, do problems 37-44 (general integration), 45-50 (partial fractions), 51-60 (integration tables) and 69-76 (improper integrals).  
**Notes:** The final exam will be given at 7:30 AM on Wednesday, 12/15.

11/30  **Sections:** 7.3, 7.7  
**Agenda:** Review of integration. Trigonometric techniques. Improper integrals.  
**Review:** In 7.3, do problems 3-45 odd.

12/1  **Sections:** 8.2-8.5  

12/2  **Sections:** 8.6  
**Review:** In 8-R, do problems 19 and 21, and 25-49 odd.

Math 107H Fall 2004 Cumulative Homework List

4.5:  5-15 odd, 17-23 odd, 41-45 odd, 55, 57, 71, 77.
4.6: 5-15 odd, 47-51 odd, 67, 69.
4.7: 7, 9, 13, 17, 31.
4-R: 45-61 odd.
5.1: 5, 29.
5.2: 9, 11, 17, 21, 23, 31.
5.3: 13-17 odd.
5.5: 7, 15, 25, 27, 35.
5.6: 7-19 odd, 37, 39, 41.
5.7: 9, 13, 19, 25, 31-37 odd.
5-R: 7, 11, 13, 15.
6.2: 19-27 odd, 27, 33, 37, 38, 45, 47.
6.7: 5-23 odd.
6.8: 5, 9, 17-25 odd.
6.9: 25-29 odd.
7.2: 7-13 odd, 19-23 odd, 41, 43.
7.3: 3, 3-45 odd, 51.
7.4: 3-13 odd.
7.6: 7-25 odd.
7.7: 3-21 odd, 27, 28, 31, 32, 45, 46, 51-59 odd.
7-R: 1-60, 69-76.
8.1: 15-49 odd, 59.
8.2: 5-15 odd.
8.3: 5-31 odd.
8.4: 5-15 odd.
8.5: 5-27 odd.
8.6: 5-45 odd.
8.7: 7-27 odd, 33-51 odd.
8.8: 5, 7, 11, 13, 19, 21, 23, 27, 29, 37.
8.9: 5-17 odd, 25, 30-35.
8-R: 19-22, 25-49 odd, 53-75 odd.
9.1: 5-21 odd, 35-37 odd, 43-47 odd, 61, 62.
9.2: 5, 7, 13, 17, 21, 23, 43, 44.
9.3: 5, 7, 27, 29.
9.4:
9-R: