MATH U142 Spring 2006- Assignments for Calculus II
Main topics: Integration, differential equations, multivariable calculus

TEXT: - Greenwell, Ritchey and Lial, *Calculus for the Life Sciences* (2003)
ISBN #0-201-74582-8, Addison-Wesley Chapters 7-9, some of Chapters 11-13.

CLASSPAC: Math U142 Spring 06 (available at NU Reprographics, after Jan 13).

Prerequisites: Math U141 or equivalent calculus preparation, including antiderivatives. We will review some beginning integral calculus material taught in Math U141.
A review problem set will be given at the start of the course: you can use the results to gauge your preparation.

Differential Calculus is the study of rate of change, and its uses.
Integral Calculus is the study of amount given the rate of flow.

Goals: To develop *graphical*, *numerical,* and *algorithmic* understanding of
1. The basic ideas of integral calculus: integral as accumulated change, amount from flow, area under a curve.
2. Definition of the integral as limit of a sum. Approximation of the integral using Riemann sums, trapezoid sums, and Simpson's rule.
3. Fundamental Theorem of Calculus, relating the integral and antiderivative.
4. Applying integral calculus to find areas and volumes; application to probability.
5. Multivariable differential calculus: partial derivatives, extremal values of multivariable functions, tangent plane. Multiple integrals to find area, volume.
6. Differential equations: solutions, slope fields, Euler's method, separable equations. Systems of two differential equations, phase plane (optional).
7. Students completing the course should be able to *recognize* and *use the concepts and methods* of calculus when they occur in their disciplines.

Blacboard Site: Class information, Syllabus, Assignments, Special assignments and Discussion.
Following is an overall syllabus, intended as a guide. I will make specific assignments from thetext and the Class Pac. Do both odd/even problems. * = "Optional".
NOTE: R&OL=Read and Outline section: Please write 2-4 pages of outline and summary, giving the main ideas. Include any questions as to what might be unclear and mention points you find important, amusing, hard, or puzzling.

6. Differentiation and linear approximation: Worksheet #LA (Lin Approx).
6.3 Implicit differentiation: p. 347 #1-9 odd, #19-23,35,41-44.
6.4 Related rates: p. 353 #1-3,9-13,23-25,28,32-33.
6.5 Differentials, linear approximation: p. 361 #1-8, 11,12,19-26.

7. Integration
§7.1 Antiderivatives (review): p. 378 #1-4,5-30,45-48,51-56.
§7.2 Substitution method: p.387, #2-34,36,38. Worksheet #1A.
§7.3. Area and the definite integral (Riemann sums)
p. 397, #1,3-5,6-22,23-26,29-36.

§7.4 Fundamental Theorem of Calculus p. 409 #1-23, 31-33,41-44,46,51-52.
p. 411 #53-62,64-67.
§7.5. Integrals of Trig Functions : p. 418 #1-15, 25-27, 31-33,35.
Using integral tables: Worksheet #1B.
§7.6 Area between two curves p. 424 #1-9,22-25,27,29-30,35-36.
§7 Summary p.428 #19-28,31-33,41-48,58-61,63-65,67-71,73-79
Extended Application p. 433-435 #1-4.

8. Techniques of integration, application to volume, flow and amount

§8.1 Numerical integration, trapezoid, Simpson's rules p. 443 #1,5-7,13-16,17-20,
p. 445 #23-35.
§8.2 Integration by parts (lightly): p. 454 #1-11 odd, 21,23,35, 40-44.
§8.3 Volume and average value: p. 461 #1-9,18-22,24,26-29,36,38-40. Worksheet #2.
§8.4 Improper Integrals (infinite domain) p. 467 #1-8,27-30,31-33,37-38,44-47.
§8 Summary p. 469 #6-9,11-15,27-29.33-40,43-44,45-49
Extended Application p. 472-474. Ex 1-3, also Flow/Amount, Worksheets #3

9. Multivariable Calculus

§9.1. Functions of several variables. p. 485, #1-2,6-7,14-17,22-27,28, 32-37,39-44.
§9.2 Partial Derivatives: p. 495 #3-8,18-25,35-38,39-42, 45,47-60,63-64,66.
§9.3 Maxima and Minima p. 506 #1-8, 21-23. 32-33.
§9.4. Total differentials and approximations. p. 512 #1-3,9-11,15-24.
§9.5 Double integrals p. 524 #1-7, 13-17, 23-26,33-38, 41-44, 53-55. 64-65,68-69. WS #4
§9 Summary: p. 527 #2-3,4-6, 14-18,26-27,34-37,42,45-46,47-48,51-53,57-60,
63-64,65-69,73-77.
Extended Application: Optimization for a predator p. 531-532.

11. Differential Equations

§11.1 Elementary and Separable Equations: p. 611 #1-15,19-23,27-28,33,38-42,52.
§11.2 Linear first order DE: p. 621 #1-7,15-17,23-25,31,34-35,
§11.3 Euler's method: p. 628 #1-5,11-14,21,25.29,30-36.
§11.6 Applications of DE: p. 650 #1-16
§11 Summary, including Newton's Law of Cooling and Logistic Equation: WS #5
p. 652 #5-12,13-20,25-27,33,38,43-44,45-46, 47-52,59-61.
Extended Application: Pollutants of Great Lakes: p. 656-657, #1-6.

13. Probability density functions.

§13.1 Continuous Probability p. 735 #1-7,11-13,23-25,27-30,32-35,37-39.
§13.2 Expected values and variance: p. 744 #1-5,9-10,11-13,15-16, 21-32. Worksheet #6
§13.2 Special density functions -- exponential, normal distributions
p. 756 #1-8,11-14,27-38.
§13 Summary p. 760 #2-23, 33-38,40-41
Extended Application: exponential waiting times p. 765-767, #1-6.

Systems of ODE (optional topic)

§ 10.1*-10.4* Intro to systems of two linear equations, matrices. (instructor to choose)
§10.5* Eigenvalues/eigenvectors of 2x2 matrices p. 593 #`-3,14,19-21.
§11.4*. Linear systems of DE p. 637 #1-4,9,15
§11.5* Nonlinear systems of DE, phase diagrams: p. 644 #1-8,9-14.

HELP: is available from Office Hours; Tutoring is available free at the Math Center in Nightingale Hall (up to several hours/week), or you can request a tutor for the semester at the Tutoring Center in Snell Library.