MATH U142: Calculus II
Spring 2007

Course Information

Course:	MATH U142: Calculus II.
Time and place:	MWTh 9:15-10:20 AM, 409 Robinson.
Textbook:	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.
Instructor:	Dr. Hani Sadaka
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Email:	h.sadaka@neu.edu
Office hours:	Mon., Wed. 11:45 - 12:45 AM, or by appointment.
Grade	Quizzes: 40%, Midterm 20%, and Final Exam: 40%

Prerequisites: Math U141 or equivalent calculus preparation, including antiderivatives.

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.

If you have a concern about the course or the instructor that cannot be resolved by speaking with the instructor, please contact Professor Alex Martsinkovsky (undergraduate director), 471 LA, x5510, alexmart@neu.edu.

Homework

6. **Differentiation and linear approximation**

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.
§7.3. Area and the definite integral (Riemann sums) p. 397, #1,3-5,6-22,23-26,29-36.
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§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.
§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.
§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.

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.
§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:
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.
§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.