MATH U141 Fall 07 - Calculus I - MWTh 8:00 AM – 9:05 AM at 235FR

Prof. Marina Ville, Nightingale 540, ext. 5530 villemarina@yahoo.fr

Office hours: **M 10:00-11:00, W 10:00-12:00 and by appointment**

TEXT: Hughes-Hallett et al, *Applied Calculus*, 3rd ed.,2006 (green cover)
ISBN #10;0-471-68121-0, John Wiley & Sons, Chapters 1-5, part of 7,10.
CLASS PACKET: Math U141 Fall06 (available at NU Reprographics about Sept 8).

PREREQUISITES. Knowledge of basic algebra at the level of MTHU121, including an introduction to functions and their graphs. A placement quiz will be given at the start of the course: you can use the result to gauge your preparation.

COMPARISON WITH OTHER NU CALCULUS COURSES. You can find it at
http://www.math.neu.edu/~iarrobino/MathU141HP.htm

GOAL OF THE COURSE. Calculus was invented by Newton more than two centuries ago to understand the movement of the Earth around the Sun. Since then, this incredibly useful set of techniques has entered many other fields, from physics and engineering to biology, economics, finance, sociology etc. After you complete this course, you should be able to recognize and use concepts and methods of calculus when they occur in your discipline.

HOW TO SUCCEED. In order to succeed in this class, you have to **work seriously and consistently** throughout the semester. Before the class, you must read chapters in advance of our class discussion of them and prepare questions for discussion. Doing the **homework** carefully is really important: in order to master the material, it is not enough to follow the lecture but you need to practice (a lot) by doing problems.

HOW TO GET HELP. If you do not understand something, **do not wait for the next quiz or exam to get help**.

Never be afraid to ask a question during the lecture: by pointing out something which is not clear for you, you are actually helping the other students and the lecturer.

I am **always willing to meet with students** outside of class. You can come to my office hours (see above) or make an appointment by email (to speed up this process, email me with a phone number where I can reach you to set up a time).

Finally the University offers **free tutoring** in the Mathematics Tutorial Center, 540B Nightingale (x2328). All tutoring is done on a first come first served basis. Students must come in person to schedule appointments. Tutoring begins about September 13. Usual hours:
MTuWed 9:15 AM-8PM, Thurs 9:15 AM-4PM, Fri 9:15 AM-12:45 PM.
See http://www.math.neu.edu/undergrad/math_tutoring.html for more information

OUTLINE OF THE COURSE.
There are two parts to the study of calculus. **Differential calculus** studies of rate of change, and its uses, for example we measure a population of bacteria at various times and we want to estimate how fast it is growing. **Integral calculus** goes the other way round: given is the rate of change can we find the amount? We know the population of bacteria today and we know how fast it grows, how large will it be tomorrow?

We will cover the following topics, using every time **graphical, numerical**, and **algorithmic** approaches.

1. Basic ideas of differential calculus, including average and instantaneous rates of change, definition of the derivative of a function at a point, the derivative function.
2. Basic functions – such as polynomial, exponential, logarithmic, trigonometric, using the graphing calculator as a tool.
3. Applying calculus to optimize functions (max and min), to motion problems, mathematical models of physical/biological processes.
4. Basic ideas of integral calculus: accumulated change, amount from flow, area under a curve (introduction).

We will focus quickly on the concepts of average rate, instantaneous rate, and derivative function in Sections 1.3, 2.1-2.3. We will then broaden the types of functions studied (1.5-1.10) as we extend the differential calculus in Chjapter 3, and apply the concepts in Chapters 4, 10. We introduce integral calculus in Chapter 5, and study differential equations (Chapter 10). Integral calculus is studied in detail in the sequel course, Math U142.

Graphing Calculator: You will need access to a graphing calculator equivalent to TI-82,TI-83, TI-85, or TI-86 (latter three are best). Some functions on the TI-89 or 92 or other calculators (symbolic differentiation/integration) are not allowed on quizzes or exams.

Class: Cell phones, portable computers, etc should be off while in class.

HOMEWORK. I will collect it weekly, grade one of the problems and mark it done/not done, possibly +/-. I will collect some of the worksheets as homework.

EXAMS: We will have short **quizzes** on most of the Thursday classes. There will be **no make-up** quizzes. If you miss a quiz, you will get a 0 for that quiz, unless you have a valid documented excuse. There will be one **midterm** in class on 10/25/07.
The **final exam** is on Thursday Dec. 13 at 10:30 AM and lasts two hours. **Contact the Registrar in first 2 weeks of class if you have a conflict or 3 finals in one day.**

GRADING. Quizzes and homework: 40% (the lowest quiz grade will be dropped).
Midterm: 20% Final exam: 40% or 50% if it helps your grade (with proportional change in the other components).
Incomplete grade: requires a written understanding (contract) between the Instructor and student with details about what material will be made up and how. Incompletes are normally appropriate only for a student who is doing well, but becomes ill, or has a family emergency late in the semester.

ATTENDANCE POLICY. Your regular attendance is expected, and it is your responsibility to know assignments and all information given (including changes to the syllabus), even when you are absent. Repeated absences without a valid excuse will lower your final grade.

If you have a ISSUE: first you talk with me; if we cannot resolve it, you go to the course coordinator, Prof. Anthony Iarrobindo (a.iarrobino@neu.edu, 526 Nightingale. Phone 373-5524). If it is still unresolved, ask Prof. Alex Martsinkovsky, Undergraduate Director, Mathematics Dept. 447 LA, x5679.

ACADEMIC HONESTY: It is fine to work together doing homework (studies have shown this can be particularly helpful in learning math), provided such assistance is acknowledged specifically in any work passed in, and that you understand what you pass in. Collaboration on quizzes and exams is not allowed, unless I make a specific exemption for a quiz, announced in advance.

Student Code of Conduct: see http://155.33.32.224/judicialaffairs/code.html
or Student Handbook.

" Essential to the mission of Northeastern University is the commitment to the principles of intellectual honesty and integrity. Academic integrity is important for two reasons. First, independent and original scholarship ensures that students derive the most from their educational experience and the pursuit of knowledge. Second, academic dishonesty violates the most fundamental values of an intellectual community and depreciates the achievements of the entire University community.Accordingly, Northeastern University views academic dishonesty as one of the most serious offenses that a student can commit while in college."

In Math U141, academic dishonesty on a quiz or exam, or assignment leads to a zero on the quiz or exam or assignment, that cannot be made up, as well as a letter detailing the incident to the Office of Student Conduct and Conflict Resolution. The minimum penalty for a finding of academic dishonesty by the student Judicial Hearing Board includes one year disciplinary probation.

HOMEWORK.
I will announce every week what the homework is and when it is due.

. Functions; introduction to slopes and rates:
§1.1 Functions, (review). p. 4 #2,5,8,9,11,15,22,23.
§1.2 Linear functions p. 11 #2,7,9,15,20-21,24,26-29. WS #1A, 1B
§1.3 Average rate of change p. 19 #5-8,11-15,22-25,27-28.30-32. WS #2A
§1.5 Exponential functions p. 38 #1-4,6,9,11-15,17-21,25-28.
§1.6 Logarithm p. 43 #11,12,21,27,31,33,35,37.41.
§1.7 Exponential growth/decay. p. 50 #1-13,17-19,21-23,24,27,29.
§1.8 Composites, shifts p. 55 #1,3-5,8-10,11,13-16,17-22,27-29,**30**,35,36.
§1.9* Proportion, polynomials p. 61 #1-6,13-14,17,19-21,23,25,27-28,33,36,40-41.
§1.10 Periodic, trig functions p. 68 #1-5,8,12,13,15,17-18,19-22,28,34.
Chapter 1 Review: p. 71 #1,6,9,12,15-17,31-32,,35-38,39,40,,55,57,61-68,71,74-75.
Compound Interest and e: Read p. 86-90. p. 90 #1,2,4,5,8,9,12.13.
Behavior at infinity*: Read p. 92-94. p. 95 #3,6,7,11,13,15-16,19-20,25,28. (GC)
2. Rate of change and derivative.

§2.1 Instantaneous rate p. 103 #1-4,6-9,11,13-17,19,21,23,26. WS #2A,2B.
§2.2 Derivative function p. 109 #1-8,9-12,,13,,15,19-26,27,29,30.
§2.3 Interpreting the derivative p. 116 #1-7,9-13,15,18,23,25,27-30,31-35,37.
§2.4 Second derivative p. 122 #1-7,8-9,10-12,15-16,23,26,28.
Chapter 2 Review p. 130 #-4,6,8-13,14,15-17,27-30,32-33.
§2 Limits & derivative R&OL p.135-139. p.139 #1-2,5-8 (which f'?),19-22,25-31,33.

3. Derivative Formulas
§3.1 Power rule p. 147 #5-7,9-19,23,27,40,43-45,47-48,51,59.
§3.2 Exponentials and Logarithm p. 152 Odd #1-21,23-25,27,,31,33-35,36.
§3.3 Chain rule p. 157 #Odd #1-33,35-36,42,44-47,49-52,53-56. WS #3A,B
§3.4 Product, quotient rule p. 161 Odd #3-31,Even 8-18,39,41,43,45.
§3.5 Trig functions p. 165 Odd #1-19,22,23,26.
Chapter 3 Review: p. 166 #1-38,47-49, 54-57,58-63,67-69,71-75..
Deriving the rules* p.170-172. p. 172 #4-7.
Practice p. 173 Student choice!

4. Using the derivative
§4.1 Local maxima and minima p. 180 #1-5,7,8-10,14-18,20-22,23,27-29.
§4.2 Inflection points p. 186 #1-6,8,9-10,11-15 (use SDT),26,27-31,33.
§4.3 Global max-min p. 191 #1-3,5-9,,14-16,17-20,28-30,31-39,41,43-44.45-47.
Applied Max-Min handout with problems. Also WS #4C-E, Also, MM1-3.
§4.4* Max-min in profit/cost p. 199 #4,16-17,20-22.
§4.7 Logistic growth p. 204 #3,8,9,11,12 (critique Math Model),13,16,17.
§4.8* A model for drug concentration p. 210 #2,3,4,6,7,10,11.
Chapter 4 Review: p. 213 #3,4-8,9-12,15,20,22,23,29,35,36. p.217 Proj. 2*

Special topics, further applications:
§7.1 Antiderivative: p. 281 Odd #1-18,22,Odd#25-39,54,55,56.
Motion: position, velocity, acceleration WS #4A,4B, A1-A3
§10.1 Differential equations as models p. 378 #1,3,5,6,7,9,12,14-18.
§10.2* Solutions of a differential equation p. 382 #1,3,5,10,11,12.
§10.4 Exponential growth, decay p. 394 #1,5,7,9,10,11,14,15. WS #5.
§10.5* Modeling with DE p. 403 #1,3,13,19,20,22,24,25.
Chapter 10 Review p. 414 # 1,5,15,19,22,23,27. p. 415 Proj 1*,2*.

Integral Calculus (basic ideas, some applications)
§5.1 Accumulated Change: p. 224 #1-4,7-8,10-11,13-16.
§5.2 Definite integral. p. 230 #1-4,7-8.11-12. 15 (also, use left and right Riemann sums, trapezoid sums for n=5,10,50 to estimate this integral).
§5.3. Integral and area. p. 235 #1,2 (use R-sum),5-9,10-12,17-18,22.29
§5.4. Using the integral: p. 240 #1-3,5-7,9,12-20,24.
§5.5 Fundamental Theorem: p. 245 #9-12
§7.3 Finding definite integrals: p. 289 #1-10,25,27,28,32,39-40.
Chapter 5 Review p. 246 #1-4,5-6 (use Fund Thm),12-15,17,21-23,28,30-34.