MATH U141 Spring 08 - Syllabus for Calculus I

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.

CLASSPAC: Math U141 Spring 08 (available at NU Reprographics about January 9).

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.

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 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. The basic ideas of integral calculus: accumulated change, amount

from flow, area under a curve (introduction).

5. Students completing the course should be able to recognize and use the

concepts and methods of calculus when they occur in their disciplines.

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.

Following is an overall syllabus, intended as a guide. Your instructor will make specific

assignments from this syllabus and also from the Class Pac. Note: * for 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.

1. 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. 219 #1,2,6,7,9,10,13,14,16.

§4.8 Surge function and drug concentration p. 225 #1-4,6,9.

Chapter 4 Review: p. 227 #1-4,7-10,11-14,15-19,39-40,41-42,47-48;52*, p.233 Proj. 2*

Special topics, further applications:

§7.1 Antiderivative: p. 303 Odd #1-18,22,Odd #25-47,53,54,63,65.

Motion: position, velocity, acceleration WS #4A,4B, A1-A3

§10.1 Differential equations as models p. 400 #1,3,5,6,7,9,12,14-18.

§10.2 Solutions of a differential equation p. 404 #1-3,5,7,10,11,13-15,22.

§10.4 Exponential growth, decay p. 416 #1,5,7,9,10,11,13,14,15.18. WS #5.

§10.5 Modeling with DE p. 424 #1,3,13,16-18,20a,21,23,26,28.

Chapter 10 Review p. 436 # 1,5,6,15,19,21,24,25,28a,29,23,27. p. 415 Proj 1*,2*.

§10 Theory *: Separation of Variables p. 441-444, #1-3,10-12,13,16,17,19.

Integral Calculus (basic ideas, some applications)

§5.1 Accumulated Change: p. 240 #1-7,9,11,12,14,-17,20.

§5.2 Definite integral. p. 247 #1-8,10,11,16-17,29.

§5.3. Definite integral as area. p. 253 #1-11.16-17,19-21,25,30. (area vs. signed area)

§5.4. Interpretations of the definite Integral:: p. 258 #1,3-7,10-14,17,18,23,25-31,38.

§5.5 Fundamental Theorem: p. 265 #11-13

§7.3 Finding definite integrals: p. 289 #1-10,25,27,28,32,33,35,36,39; opt: 45-47.

Chapter 5 Review p. 266 #1-4,9-10 (use Fund Thm),16-19,21-23,28, 33-34,38,40.

HELP: is available from Office Hours; Tutoring is available free at the Math Center in 540B

Nightingale (up to several hours/week).

See http://www.math.neu.edu/undergrad/math_tutoring.html for more information.

Note: A comparison of Math U141 with other NU calculus courses is given at

http://www.math.neu.edu/~iarrobino/MathU141HP.htm