MATH U141 Fall 2007 - Syllabus

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 Fall 2007 (available at NU Reprographics).

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 (Sections 1.5 - 1.10) as we extend the differential calculus in Chapter 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, MTH U142.

Following is an overall syllabus, intended as a guide. I will make specific assignments from this syllabus and also from the Class Pac. Note: * for Optional.

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. cont.

§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.

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 # 1-4, 6, 8-13, 14, 15-17, 27-30, 32-33.

§2 Limits & derivative Read 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, 7, 9, 10, 13, 14-19.

§4.8* A model for drug concentration p. 225 #1-4, 6-9, 10.

Chapter 4 Review p. 227 # 1-4, 6, 7-10, 11-14, 15-19, 21, 38-39, 40, 41-42,47-48, 50-53.
p.233 # 2*

5. Integral Calculus (basic ideas, some applications)

§5.1 Accumulated Change p. 240 # 1-7, 8-11, 14-18, 20.
§5.2 Definite integral. p. 247 # 1-7, 8-9, 10-13, 15-17. WS# 6A,B.
§5.3. Integral and area. p. 253 # 2 (use R-sum), 3-11, 16, 19-22, 23-30 (Use §7.1).
§5.4. Using the integral. p. 258 # 1-7, 8-9 (use §7.1 or calculator integral), 10-11, 12-13 (use §7.1), 14-16, 23-24, 25-28, 29-33.
§5.5 Fundamental Theorem p. 264 # 11-13. WS #7A,B.
Chapter 5 Review p. 266 # 1-8, 16-19 (use §7.1), 21-23, 25-26, 28-29, 35, 38, 40-41, 42-44.
§7.1 Antiderivative p. 303 Odd # 1-31, Odd # 33-49, 63-66.
Motion: position, velocity, acceleration WS #4A, 4B, A1-A3
§7.3 Finding definite integrals: p. 312 # 1-12, 26-33, 39, 42-43, 44-45.

6. Differential Equations

§10.1 Differential equations as models p. 400 # 1-11, 14-15.
§10.2 Solutions of a differential equation p. 404 # 1-5, 7-10, 12, 13-21, 22.
§10.3* Slope fields p. 410 # 1-5, 7, 8, 10-11.
§10.4 Exponential growth, decay p. 416 # 1-3, 9-16, 17-18. WS #5.
§10.5 Modeling with DE p. 424 # 1-5, 13, 16-18, 25-26, 28.
Chapter 10 Review p. 436, # 1, 2, 9-11, 20-21, 25-29, 34-35.
p. 438 Proj . 1*, 2*.
Separation of Variables* p. 441-444, # 1-3, 10-12, 13, 16, 17, 19.

HELP: is available from my office hours; also free tutoring at the Math Tutoring Center in 540B NI (Hours: M,Tu,W 10am–9pm, Th 10am–6pm, F 10am–1 pm).