**MATH U141 Summer I-2008**
**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.

**Prerequisites:** Knowledge of basic algebra at the level of MTHU121, including an introduction to functions and their graphs.

**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 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, Math U142.

**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.

Following is an overall syllabus, intended as a guide. Your instructor will make specific assignments from this syllabus.
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.
1.3 Average rate of change p. 19 # 5-8, 11-15, 22-25, 27-28, 30-32.
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.

2. Rate of change and derivative.
2.1 Instantaneous rate p. 103 #1-4, 6-9, 11, 13-17, 19, 21, 23, 26.
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.

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.
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..

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, 43-47.
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

7.1 Antiderivative: p. 303 Odd #1-18,22,Odd #25-47, 53, 54, 63, 65.
Motion: position, velocity, acceleration

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.
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.
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.
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.