92.122 Management Calculus
Spring 2009

Text: Larson, **Brief Calculus, An Applied Approach**, 8th edition, Houghton Mifflin, 2009; and accompanying **Student Solutions Guide**.

Note: The texts are packaged together at a reduced price.

Goals and objectives: This applied calculus course is a reform calculus approach for non science students. Emphasis will be given to a graphical understanding of calculus concepts, especially with regard to applications. A solid foundation in Pre-Calculus Mathematics is assumed.

The strategies will consist of business and economics related applications to the mathematical concepts as they are developed through graphical, numeric and analytic procedures. The primary objectives are:

- Differential calculus:- Slopes of lines will be viewed graphically and limiting cases examined to understand the meaning of a derivative. Relative maximum and minimum will be identified and applications developed for revenue, cost and profit functions. Rates of change (derivatives) will be graphed to identify roots and changing values in order to facilitate discussion of marginal analysis. For optimization problems, graphical and numeric techniques will be used to help identify solutions. Elasticity of demand applications will also be examined. In all cases, students will be responsible for analytic methods of solution.
- Exponential and log functions:- Natural logarithm and growth/decay functions will be graphed, trends discussed and applications developed for compound interest, demand functions and present value.
- The development of integration techniques as an antidifferentiation process:- Technology will be used to both evaluate and show regions represented by definite integrals. These concepts will be applied to average value, consumer/producer surplus discussions and present value of an income stream.

In addition, technology will be used as necessary to help

i) define and solve systems of linear equations.
ii) model data with least squares regression procedures

Grading policy: A combination of quizzes and projects will be given following material coverage and review. Quizzes will be based on assigned homework. These quizzes and/or projects will account for 20% of the grade. There will also be three one hour examinations. Each of these examinations will account for 20% of the grade. The comprehensive common final examination will be worth the remaining 20% of the grade. One half of an 8.5 by 11 sheet of paper with notes on both sides will be allowed for the common final. Participation in class will be recognized as an asset in final grade evaluation. Graphing calculators can be used on all quizzes and exams. The MAST Module 2004-2005 material at http://faculty.uml.edu/mstick/92.122/material.htm will be used as a resource for projects.

A guideline for course grade assignment will be:

FINAL AVERAGE	94-100	90-93	87-89	84-86	80-83	77-79	74-76	70-73	67-69	58-66	0-57
	A	A-	B+	B	B-	C+	C	C-	D+	D	F

Arrangements are possible in individual sections for adjusted weights to be assigned in order to enhance individual overall performances.

Attendance policy: There will be three 50 minute meetings per week. Students are expected to attend all classes and are responsible for all material covered. Quizzes and hourly exams will be given during class time. A missed quiz, late lab assignment or missed examination will result in a **zero** grade unless prior arrangements or acceptable written documentation is provided. Details of the attendance policy follow:

1. Attendance is required;
2. Students are allowed ONE unexcused absence;
3. Additional absences are excused only if the request is accompanied by a Doctor's note or a note from the Dean of Students on appropriate letterhead. This encompasses all situations and unforeseen hardships (accidents, illness, death of a relative, etc.);
4. TWO points will be deducted from the student's final course average per unexcused absence (minus the one allowed);
5. To monitor attendance, at the instructor's discretion, each student will **sign** his or her name to a daily attendance sheet. No signature will be accepted for any student entering class after the first 15 minutes of scheduled class time and no sign-in for a particular class will be allowed other than the day of that class.

Technology: The TI-84 Plus Silver Edition will be used throughout the course as a visual aid for learning. While technology will be used, students are responsible for mastery of analytic procedures presented.

The following should serve as a guide for exam coverage. It represents sections that are traditionally included.

Week	Sections to be covered
1	1.2
2	1.3, 7.7, handout
3	handout, 1.4, 2.1
4	2.1, 2.2, 2.3
5	Review, exam 1, 2.4
6	2.5, 2.7, 3.1
7	3.2, 3.3, 3.4
8	3.4, 3.5, 3.8
9	Review, exam 2, 4.1, 4.2
10	4.4, 4.3, 4.5
11	4.6, 7.7, 5.1
12	5.4, 5.5, 5.6
13	Review, exam 3, 6.1
14	6.1, Review

Syllabus
92.122 Management Calculus

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\# $\int e^u du$ treated with these problems

* Use technology or midpoint rule approximation for integration by parts problems.

** Optional material

Section	Topic	Exercises
1.2	Graphs of Equations	3-15odd,21-27odd,33,39,45,49,53, 61,63
1.3	Lines in the Plane and Slope	25-37odd,49,53,67,87abce,88,89,91, 92,93,95
7.7	Least Squares Regression Line	1,3,9,27,31,39,40,41
Handout	Systems of Linear Eqs in 3 Variables	p480/13,19,53,55
1.4	Review of Functions	9,12,17,19,21,23,31,67,70,72
1.5**	Limits	1,3,5,19,21
2.1	Derivative and Slope (as a limit process)	5-19odd,39,51,56,63
2.2	Rules for Differentiation	1-13odd,19,21,23,29,39,41,49,53,65
2.3	Marginals and Applications	1-9odd,17-29odd,37
2.4,2.5	Additional Differentiation Rules	p161:1,7,9,11,17,19,25,27,41,43,55, 61 p172:23-35odd,41,43,55,57,61,67, 73,78
2.7	Implicit Differentiation	1,3,13,29
3.1,3.2	Relative Minimum and Maximum	p213:3,5,7,15,39,43 p223:1,3,5,9,21,23,47,49,51
3.3	Diminishing Return	31,35,61,62
3.4	Optimization	1,11,12,15,17
3.5	Business and Economics Applications: Optimization and Elasticity of Demand	1,5,9,13,15,17,21,27,29 also p288:51,52,54
3.8	Differentials and Marginal Analysis	1,5,7,11,13,29,31,33
4.1	Review of Exponential Functions	1,5,13,17,19,21,31,37
4.2	Natural Exponential Functions	1,3,15,16,33,35,37,39,41,46,51
4.4	Review of Logarithmic Functions	1,5,7,9,23,25,31,35,39, 41,47,51,53, 55,57,59,78,81,87
4.3	Derivatives of Exponential Functions	1,3,7,23,25,27,33,41
4.5	Derivatives of Logarithmic Functions	1,7,9,15,17,21,23,73,79,83
4.6	Exponential Growth and Decay:	1,24,39,41,42(goal: $y = Ce^{kt}$),45
7.7	Applications of polynomial and exponential (goal: $y = Ce^{kt}$) least squares models	30,32,33,34,39,45-50
5.1	Antiderivatives and Indefinite Integrals	1-19odd,49,51,55,59,63,65,67
5.4#	Area and the Fund Theorem of Calculus	1-17odd,61,65,67,79,83,95,96
5.5	Area of a Region Bounded by Two Graphs,	1,3,5,41,43,47,49

	Consumer and Producer Surplus	
5.6	Midpoint Rule Approximation	1,3,5,38a),39 (n=2,4)
6.1*	Present Value	66,69,75,76

Additional notes:

All non optional material will be covered.

The following handout will be provided:
Handout 1: College Algebra, Larson and Hostetler, 7th ed., Sec 6.3 Multivariable Linear Systems, p.471-476.

1. The three one hour exams will be individual exams for each section. Based on input from all instructors, the common final will be created.

2. The TI should be used to encourage learning by visual, numeric and analytic approaches.

3. Some of the exercises are specifically included to reinforce use of a graphing utility as a tool in solving the problems.

4. The goal for present value problems in Section 6.1 is for students to be able to set up problems of the type $\int_0^{t_1} ce^{-rt}dt$. Integration by parts will not be covered analytically and for arbitrary functions $c(t)$ in the integrand for present value, technology or midpoint rule approximation will be used.

5. The attendance policy WILL be followed. Further, to set the tone that students need to conscientiously do the homework, two evaluations (quizzes or exams) will be given by the end of the second week of class.

Graphing Calculator Implementation

Systems of Equations

- $ax + by = c$
- $dx + ey = f$
- $y_1 = y_2$: 2nd CALC intersect
- $AX = B$
- $X = A^{-1}B$

ex: $3x + 2y = 7$
$5x - y = 3$

a) MATRX, -> to EDIT, 1 to edit matrix A
b) 2 enter (row), 2 enter (column)
3 enter 2 enter
5 enter -1 enter to define matrix A then 2nd QUIT
c) MATRX, -> to EDIT, 2 to edit matrix B
d) 2 enter (row), 1 enter (column)
7 enter
3 enter to define matrix B then 2nd QUIT
e) to compute $X = A^{-1}B$, MATRX 1 (i.e. matrix A), x^{-1} (inverse of A),
* (multiplication symbol is optional) MATRX 2 (i.e. matrix B), enter

output is $\begin{bmatrix} 1 \\ 2 \end{bmatrix}$

f) MATRX, 1, x^{-1} enter, yields A^{-1}

ex: show that $AA^{-1} = I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$: MATRX, NAMES, 1 (i.e. matrix A)

then * (optional), MATRX, NAMES, 1 (i.e. matrix A), x^{-1} (inverse of A), enter

Linear Regression

ex: Model the Dow Jones (D.J.) weekly data with a linear regression model $y = ax + b$.

a) STAT, EDIT to create data

$L_1(time)$	$L_2(D.J.)$	$L_1(time)$	$L_2(D.J.)$
1	8775	6	8750
2	8625	7	8725
3	8650	8	8825
4	8550	9	8950
5	8700	10	9025

b) 2nd QUIT, 2nd CATALOG, DiagnosticOn, enter (twice)
c) STAT, CALC, LinReg(ax+b)
d) LinReg(ax+b) L_1, L_2, y_1 enter
e) 2nd STAT PLOT, option 1 , on
f) ZOOM, option 9
g) turn off plot 1 at y=screen or at STAT PLOT