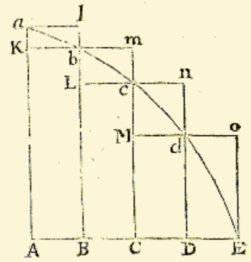

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Stony Brook University MAT 126 -- Calculus -- Fall 2008

(Integration)

- Index
- Course Description
- Teaching Staff, Office Hours
- Syllabus and Homework
- Calculator programs

Final Examination

Thursday, Dec 18   2:00 PM - 4:30 PM

You take the final in the room determined by which section you are registered in as follows:

- JAVITS 100: Recitation Sections 1-7 and ELC 90
- OLD ENG 143: Recitation Sections 8, 10 and 13
- OLD ENG 145: Recitation Sections 14, 15 and 16

Final Exam Review

Where to go for help:

- Go to your recitation class!
- MAT 126 staff Office Hours
- Math Learning Center
- P.A.S.S. (Student-government funded tutoring service)

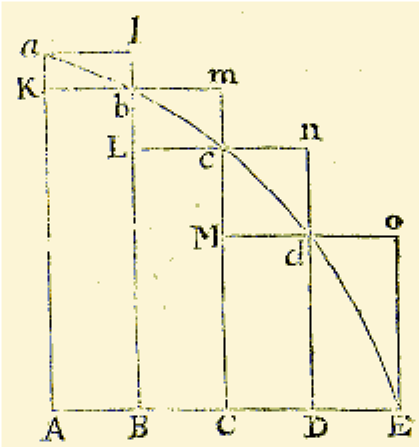
NO CALCULATORS   CELLPHONES MUST BE OFF

Schedule: see Current Semester Schedule, scroll down to MAT 126.

DSS advisory: If you have a physical, psychological, medical, or learning disability that may impact your course work, please contact Disability Support Services (631) 632-6748 or http://studentaffairs.stonybrook.edu/dss/. They will determine with you what accommodations are necessary and appropriate. All information and documentation is confidential. Students who require assistance during emergency evacuation are encouraged to discuss their needs with their professors and Disability Support Services. For procedures and information go to the following website: http://www.stonybrook.edu/ehs/fire/disabilities/asp.

Academic Integrity: Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another person's work as your own is always wrong. Faculty are required to report any suspected instance of academic dishonesty to the Academic Judiciary. For more comprehensive information on academic integrity, including categories of academic dishonesty, please refer to the academic judiciary website at http://www.stonybrook.edu/uaa/academicjudiciary/.

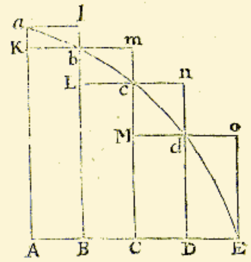
Disruptive Behavior: Stony Brook University expects students to respect the rights, privileges, and property of other people. Faculty are required to report to the Office of Judicial Affairs any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, and/or inhibits students' ability to learn.



This image is adapted from a figure in Newton's *Principia* (1687). It illustrates his treatment of integration, and his proof that for a monotonic function `f` defined on an interval `[A,E]` the difference between the upper and lower sums with `n` equal subdivisions is equal in absolute value to `(f(E)-f(A))(E-A)/n` (and therefore goes to 0 as `n` goes to infinity). Here `n`=4.

Back to MAT 126 index page.

Anthony Phillips
Math Dept SUNY Stony Brook
email: tony at math.sunysb.edu
February 5, 2008



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Stony Brook University
MAT 126 -- Calculus -- Fall 2008

(Integration)

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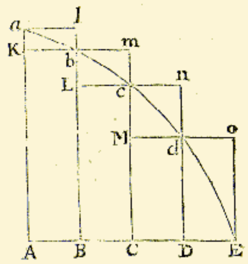

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Stony Brook University
Calculus B -- Fall 2008

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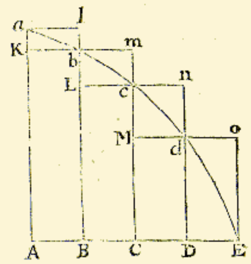
- [Calculator programs]

Course Description:

MAT 126-C Calculus B

A continuation of MAT 125, covering integral calculus: the fundamental theorem, symbolic and numeric methods of integration, area under a curve, volume, applications such as work and probability. May not be taken for credit in addition to MAT 142 or AMS 161.
Prerequisite: C or higher in MAT 125 or 131 or 141 or AMS 151 or level 6 on the mathematics placement examination
3 credits

- **Text:** Stewart *Single Variable Calculus* (Stony Brook Edition).
- **Syllabus:** Chapters 5 and 6 of Stewart.
- **Exams:**
  - Midterm 1: Monday October 13, 8:30 PM
  - Midterm 2: Wednesday November 5, 8:30 PM
  - Final: Thursday Dec 18, 2:00 PM - 4:30 PM
- **Calculators:** Students should have a TI-82 or TI-83 calculator, and bring it to class.
  Calculators will *not* be allowed during examinations.
- **Quizzes:** Beginning in week 2, there will be a weekly 15-minute quiz administered at the beginning of the recitation section. The quiz will duplicate one or two of the homework problems assigned for the previous week, probably with changes in the numerical values. These quizzes will count for 20% of the total course grade.
- **Grading:** Midterm Exams 20% each; Final Exam 40%; Recitation grade (quizzes) 20%.
- **Course coordinator:** C Denson Hill 2-113 Math Tower, 632-8251.



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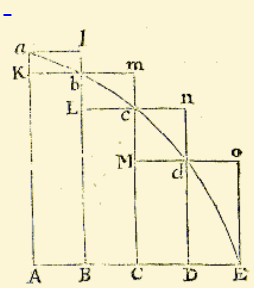
Stony Brook University
Calculus B -- Fall 2008

Staff and Office hours

Ljudmila Kamenova Lecture 1	kamenova@math.sunysb.edu	Wed 1:30-2:30 in MLC Tue, Thur 2:30-3:30 in 3-115
Azita Mayeli Lecture 2	amayeli@math.sunysb.edu	Fri 11:00-2:00 in 3-109.
C Denson Hill Lecture 3 course coordinator	dhill@math.sunysb.edu	Tu-Thur 2:00-3:30 in 2-113.
Luca Di Cerbo Recitation 1	luca@math.sunysb.edu	Tue 4:00-6:00 in MLC Thur 11:30-12:30 in 2-114
Shane D'Mello Recitation 2, 15	shane@math.sunysb.edu	Wed 11:45-12:45 in his office in MLC Wed 4:00-6:00 in MLC
Stephen Chu Recitation 3, 5	syc@math.sunysb.edu	Mon, Fri 12:00-1:00 in MLC Mon 2:00-3:00 in 3-104
Xiaojie Wang Recitation 4, 7	wang@math.sunysb.edu	Wed 8:00-9:00 and Thur 5:00-6:00 in MLC Tue 3:50-4:50 in 2-106
Carl Hammarsten Recitation 6	chammar@math.sunysb.edu	Fri 11:00-1:00 in MLC Mon 2:40-3:40 in 4-116
Vamsi Pingali Recitation 8, 10	vpingli@math.sunysb.edu	Wed 7:00-8:00 and Fri 1:00-2:00 in MLC Wed 3:40-4:40 in S-240C

Benjamin Balsam Recitation 13	balsam@math.sunysb.edu	Wed 10:35-11:35 in 3-104 Mon 10:30-12:30 in MLC
Gerardo Arizmendi Recitation 14	gerardo@math.sunysb.edu	Mon 10:00-12:00 in MLC Mon 12:00-1:00 in his office in MLC.
Ning Hao Recitation 16	nhao@math.sunysb.edu	Wed 11:00-12:00 in 2-120 Tue 5:00-6:00, Wed 10:00-11:00 in MLC
Pawel Nurowski ELC Lecture 90	nurowski@math.sunysb.edu	Tue 5:00-6:00 in 3-102 Thur 3:40-5:40 in 3-102



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Stony Brook University
Calculus B -- Fall 2008

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Schedule, Syllabus and Homework for Fall 2008

Sections and Exercises from Stewart, Single Variable Calculus *(Stony Brook Edition)*

Week of	Sects.	Homework Quiz questions will be closely modeled on these problems.	Notes
Aug 31	5.1	2, 3, 4, 5, 6, 11, 13, 15, 16, 24	
Sept 7	5.2	1, 2, 4, 6, 7, 11, 14, 17, 31, 41, 45	
Sept 14	4.9 5.3	1, 3, 7, 13, 15, 19, 29, 37 6, 7, 8, 18, 19, 20, 47, 48, 63	review derivatives!
Sept 21	5.4	3, 5, 9, 10, 11, 18, 19, 26	
Sept 28	5.5	3, 6, 11, 26, 33, 42, 60, 62 Read about differentials in section 3.8.	No class Tue 9/30
Oct 5	review		No class Thur 10/9
Oct 12	5.6	1, 5, 7, 9, 11, 13, 15, 17, 25, 27, 37, 38, 39, 40	Midterm 1 Mon 10/13 8:30-10PM covers 4.9, 5.1-5.4 Review
Oct 19	5.9	1, 3, 5, 9, 15, 17, 26, 38, 40	
Oct 26	5.10	1, 3, 5, 7, 9, 13, 15, 17, 19, 41, 49, 47, 58	

Nov 2	review 6.1	1, 2, 5, 7, 9, 11,17, 21, 22, 23, 31, 35	Midterm 2 Wed 11/5 8:30-10PM covers 5.5, 5.6, 5.9 Review
Nov 9	6.2	1, 3, 5, 7, 9, 11, 15, 25, 27, 29, 33, 41, 45, 51a	review Pythagoras' Theorem and similar triangles
Nov 16	6.3 6.4	1, 2, 3, 5, 7, 9, 13 (use *n* = 4), 23 1, 3, 5, 9, 11 (use *n* = 3), 12, 15	
Nov 23	6.5 work and moments/ center of mass only	1, 3, 5, 7, 10, 11, 17a, 21, 32, 25, 37, 39	No class Thur 11/27
Nov 30	6.7	1, 2, 3, 5, 7, 8, 9, 10, 11	
Dec 7	final review	No homework	Classes end Dec 15
Thur Dec 18, 2:00 PM - 4:30 PM : Final exam Final review			

MAT126 Fall 2008 Review for Final

Review Chapter 5 using Midterm 1 Review and Midterm 2 Review.

5.10 Understand the definition of an improper integral as a limit of definite integrals (*Definitions on pp.424 and 427*). Understand that the integral *converges* if the limit exists, and *diverges* otherwise. *Examples 1,2,3* are important. Understand the behavior of the $1/x^p$ integrals from 1 to infinity: converge if $p>1$, diverge otherwise (Box 2, p.427), *Example 4*. *Exercises 5-10* (be ready to use substitution!). Also *Exercises 13,14,18,19* which use a preliminary integration by parts. Understand the behavior of the $1/x^p$ integrals from 0 to 1: converge if $p<1$, diverge otherwise. *Examples 5,6,7*. Understand Example 8 - requires integration by parts: it means that $\ln(x)$ gives a convergent integral from 0 to 1. *Exercises 23,24,25,26*.
The Comparison Theorem will not be covered in this examination.

6.1 Be able to do a problem like *Example 2* (find area enclosed by two curves): locate intersection points, set up integral with correct sign (need to know which curve is higher), and evaluate (*Exercises 7,9,13,15*). Be able to integrate with respect to y when appropriate (*Example 5, Exercises 11,12*). Be able to use numerical techniques (*Example 4, Exercises 21-24*). Be able to handle curves that intersect twice or more (*Exercise 27*). Be able to calculate areas enclosed by parametric curves (*Example 6, Exercises 31, 35*).

6.2 Understand how to calculate a volume by the method of slices: determine your axis of integration, find volume of infinitesimal slice ($dV = A(x)dx$ if x is the variable of integration, $A(x)$ the cross-section for given x) and integrate dV between appropriate endpoints. See "Definition of Volume," p.449. For solids of revolution the axis of integration is the axis of symmetry (*Examples 1,2,3,4, Exercises 1-6*). Know how to handle the situation when that axis is parellel to but not equal to a coordinate axis (*Examples 5,6, Exercises 13,14*). Understand how to set up integrals for more general volumes (*Examples 7,8, Exercises 30,33,34,35*). Be able to use the method of circular shells, especially when the slice method leads to difficult equations or integrals (*Example 9, Exercises 49,50,51b*).

6.3 Be able to set up the integral giving the length of the graph of a paramtric curve $x = f(t), y = g(t)$ between $t=a$ and $t=b$. Box 1 p.463, *Example 1, Exercises 4,5,6*. Understand the special case where the curve is the graph of $y = f(x)$ (you use x as your parameter) *Examples 2,3,4, Exercises 3,7*. Since these integrals are often difficult or impossible to solve by anti-differentiation, be able to use numerical methods (*Example 2, Exercises 11, 12* (use n = 3 or 4 if doing it by hand).

6.4 Understand the definition of the average value of a function on an interval (Box p.468). (*Example 1, Exercises 5,11,12,13*).

6.5 Understand how the formula Work=Force x Distance becomes an integral when the force varies over the distance. (*Examples 1,2, Exercises 1,2,3,4*). or when both force and distance vary during the problem (*Examples 3,4, Exercises 10,11,17a,18*).
Be able to calculate the center of mass of a plate of constant density (Figure, p.476) of the special type shown on p.478: it has the shape of the area under the curve $y = f(x)$ for x running from a to b. See Box 12, p.479; A is the total area of the plate. (*Example 7* - note use of symmetry to simplify calculation; *Exercises 37-40*).

6.7 (Will not be on final!) Understand that a probability density function $f(x)$ is a positive function with total integral = 1, and how the integral of f from a to b represents a certain probability (that the value of the associated random variable will lie between a and b). (*Example 1. Exercises 1,2,3*). Understand that an exponentially decreasing probability density function $f(x) = 0$ for x negative, $f(x) = c\ e^{-cx}$ for x positive must have the same coefficient c in both places (*Example 2*). Understand the *mean* of a probability density

function as the expected value of the associated random variable (discussion, p.489) and be able to calculate it (*Example 3*: the mean of the exponentially decreasing p.d.f. given above is `1/c`; *Example 4*: work backwards from the mean, *Exercises 4,5,6*). Understand the definition of *median* (p.490) and be able to calculate it (*Exercises 7,8*).
The normal distribution will not be covered in this examination.

Use the Chapter Review p.493 for further reviewing.
Concept check: 1-6,8,11,12.
Exercises 1-3 (area)
Exercises 4,5,6,7,10-14a (volumes)
Exercises 15-18 (arc length)
Exercises 19,20,21a (work)
Exercise 24 (center of mass = centroid)
Exercise 26 (average value of function)
Exercises 29, 31 (probability density functions)

MAT126 Review for Midterm I

5.1 Be able to estimate the area under a graph when the units on the x and y-axes are given (*Example 3b, Exercises 2,3*). Be able to estimate distance traveled from velocity information given as a graph (*Exercise 15*) or as a table (*Example 4, Exercises 11,13*).

5.2 Understand the relation between integral and area when the function is not always positive (*Example 2* - you do not need to know the summation formulas 5 and 6 on p.357 but you should know they exist; you should know formula 4!- *and Example 4b, Exercises 1,4,21,23*). Understand the Midpoint rule (*Example 5, Exercises 3,5,11*). Understand graphically the difference between a Riemann sum and the integral (*Example 5, Exercises 1,2,3,4*).

5.3 Understand how to use the Evaluation Theorem to calculate integrals using anti-derivatives (*Examples 1 and 2, Exercises 1,5,6,8,18* -do as many as you can for practice). Know the indefinite integrals in Table 1 p.369, and know why we write "+ C". Be able to use this information to calculate indefinite integrals of sums and constant-multiples of these functions (*Examples 3,4,5, Exercises 2-28*). Understand the Net Change Theorem along with the examples following (on pp.371,372) and how to apply it (*Examples 7 and 8, Exercises 47,48,49,50*).

5.4 Know the statement of the fundamental theorem of calculus, and how it is used.

Use the Chapter Review for further reviewing.

- Concept Check 1 through 6.
- True-False 1 through 8.
- Exercises 1 through 8 (skip 6).

October 2, 2008

MAT126 Review for Midterm II

5.5 Practice as many substitutions as you can. You need to be able to recognize a likely "u", and that comes with practice. (*Examples 2,3,4* and the more difficult *Examples 5,6,7* -each of those involves a standard "trick"; you need to know these elementary tricks. *Exercises 7-34*, as many as you can do. For definite integrals, remember that you have to EITHER transform your limits of integration to be the corresponding u-values, OR rewrite your u-antiderivative in terms of the original variable before evaluating. *Exercises 39-54*, as many as you can do.

5.6 Again, practice is essential: you need to be able to recognize what is the "u" and what is the "dv". I recommend using "Formula 2" (the "u,v" formulation). Once you have chosen "u" and "dv", write down du and v -this requires a preliminary integration!-. *Example 1*-obvious case; *Example 2*-less obvious but you should know this "trick" (*Exercises 4,6*). *Examples 3,4* each give an important wrinkle in applying "parts." Applying it several times if necessary (keep very careful track of your signs!! - *Exercises 7,8,12*); or applying it twice and then solving for the integral (*Exercises 13,14*). Be familiar with these maneuvers. *Exercises 1-24*, as many as you can do.

5.9 Remember the relation between left sum L_n, right sum R_n, trapezoidal rule T_n, midpoint rule M_n and Simpson's rule S_{2n}, that is: $T_n = (L_n+R_n)/2$ and $S_{2n} = (2M_n+T_n)/3$ (*Example 4*). This will help you derive the formula for Simpson's rule p.418 which you should know. Understand that L_n underestimates and R_n overestimates if f is increasing, and vice-versa if f is decreasing. Understand that M_n underestimates and T_n overestimates if f is concave-up, and vice-versa if f is concave-down. *Exercises 5,7,8,21,23,24*. The exercises require a calculator; understand the procedures well enough so that you can carry them out by hand for $n = 2$, 3 or 4

Use the Chapter Review for further reviewing.

- Concept Check 8,9.
- True-False 5 through 8
- Exercises 15,16,17,19,20-34 as many as you can.
- Exercises 39-42

October 25 2008