B.A. Program in Liberal Studies
Math 190B: Calculus
3 semester units
Spring Semester 2013

Instructor: Katie Kondo, M.S. expected 6/14
Class Meeting Times & Place: Week of January 14, 2013 – Week of May 20, 2013
Office Hours: Tuesday & Thursday, 8:00 am-9:00 am and by appointment
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Course Description: The course aims to apply and extend what students have learned in previous mathematics courses through the study of limits, derivatives, along with basic differentiating and integrating techniques. The course starts with five major problems that introduce the big ideas of calculus: optimization, limits, differential equations, exponential functions, the relationship between distance and velocity, piecewise functions, volumes of revolution, volumes by slicing, and the Fundamental Theorem of Calculus. Each of these five major problems is revisited again later in the course for students to solve using new calculus knowledge. Students in Calculus will continue to use problem solving strategies, questioning, investigating, and explaining in conjunction with their knowledge of the connections among algebra, geometry and functions to analyze problems and formulate solutions. Throughout, they will also use these strategies to extend their current knowledge by making new connections. The course is a college level course and requires a significant amount of preparation for every class on the part of the student.

B.A. Program Learning Objectives:

- Critical and analytical thinking ability;
- The ability to understand issues from multiple perspectives;
- The ability to connect learning to lived experience;
- Social awareness, community engagement, global citizenship;
- Core competency in foundational skills: including, writing, quantitative reasoning, information literacy, technological literacy, oral communication, and research.

Learning Objectives:
Students successfully completing the course will be able to:

- Students will be able to work with functions represented in a variety of ways: graphical, numerical, analytical, or verbal. They will understand and be able to explain the connections among these representations with respect to the derivative and definite integral.
- Students will understand and be able to explain the meaning of the derivative in terms of a rate of change and local linear approximation, and should be able to use derivatives to explain and solve a variety of problems.

- Students will understand and be able to explain the meaning of the definite integral both as a limit of Riemann sums and as the net accumulation of change, and should be able to use integrals to explain and solve a variety of problems.
- Students will understand and be able to explain the relationship between the derivative and the definite integral as expressed in both parts of the Fundamental Theorem of Calculus.

Evaluation Criteria:
The final evaluation will address the extent to which students have met the learning objectives listed above, as demonstrated in:

- Active contributions to small group and classroom discussion demonstrating constructive dialogue with peers
- Development of understanding of the selected texts and analytical skills over the course of the term, including in projects, quizzes, and exams.

Additionally, the specific components of the course grade are constructed as follows:

- Participation 5%
- Quizzes & Chapter Exams 35%
- Homework Assignments/Problem Sets 15%
- Other Written and Collaborative Projects 20%
- Final Exam 25%

The homework in the "Review & Preview" section of each lesson reinforces skills and concepts learned in the lesson, as well as practices and enriches previously introduced material and prepares students for upcoming topics. The homework problems also allow students to apply concepts and skills in new contexts and to deepen their understanding by solving the same type of problem in different ways.

Attendance Policy
Students are expected to attend all class sessions and participate as required in the syllabus. Students missing more than 4 class sessions must make up the missed time by completing assignments per instructors direction, students missing more than 10 class sessions will not receive credit for the course. See AULA General Catalog, 2010-2012 (p. 59) for university policy.

Incomplete Policy
Per University policy, students must complete all course work by the deadlines stated in the syllabus. If a student anticipates not being able to complete required work by the end of the term, the student may request an Incomplete from the instructor. Incompletes are awarded at the discretion of the instructor. See *AULA General Catalog, 2010-2012*, (p.63) for university policy.

Plagiarism Policy
Plagiarism – that is, the intentional or unintentional borrowing of another person's ideas, images, research, or data without citation -- is a serious breach of academic integrity that results in sanctions, including dismissal from the University. Please consult Diana Hacker's A Writer's Reference, 6th ed., pp. 344-347 for specific guidance on avoiding plagiarism while taking notes, summarizing, paraphrasing, and quoting from sources. Students committing plagiarism will be also be subject to disciplinary action from DaVinci Schools as well as from the University.

Student Conduct Policy

Respectful conduct is expected of students on the campus at all times, both inside and outside the classroom. See *AULA General Catalog, 2010-2012*, (p.59 &71) for further details re: Antioch University Los Angeles policy.

Students with Disabilities
Any student with a documented disability (physical, learning, or psychological) needing academic accommodations should contact the Disability Services Office (310-578-1080, ext. 441) as early in the semester as possible. All discussions will remain confidential.

Required Text:
Cho, C. (Ed.). (2010). *College Preparatory Mathematics: Calculus*. Sacramento, CA: CPM Educational Program.

***Tentative* Schedule, Outline of Class Activities, Lessons, Assessments & Assignments:**

Chapter 4: The Fundamental Theorem of Calculus

Weeks 1-3

Project: Students will participate in a mock trial, using their knowledge of velocity, position, and acceleration and the Fundamental Theorem of Calculus to build an argument for/against and solve a teacher's speeding violation case.

4.1	4.1.1	1	Definite Integrals	None	4-6 to 4-12
	4.1.2	1	Numerical Cases of Definite Integrals	Graphing calculator	4-18 to 4-26
	4.1.3	1	Properties of Definite Integrals	None	4-31 to 4-39
4.2	4.2.1	1	Deriving "Area Functions"	None	4-43 to 4-51
	4.2.2	1	Indefinite and Definite Integrals	None	4-56 to 4-64
	4.2.3	1	The Fundamental Theorem of Calculus	None	4-73 to 4-80
	4.2.4	1	The Fundamental Theorem of Calculus	None	4-86 to 4-94
4.3	4.3.1	1	Fast Times: Parts 1 & 2	None	4-98 to 4-105
	4.3.2	1	Fast Times: Parts 3 & 4	None	4-108 to 4-115
	4.3.3	1	Fast Times: Part 5	None	Closing Statement Write-up
4.4	4.4.1	1	Area Between Curves	None	4-123 to 4-130
	4.4.2	1	More Area Between Curves	None	4-135 to 4-144
	4.4.3	1 - 2	Multiple Methods for Finding Area Between Curves	Lesson 4.4.3 Res. Pg.	4-150 to 4-157
4.5	4.5.1	1	Newton's Method (optional)	Lesson 4.5.1 Res. Pg.	4-162 to 4-168
Chapter Closure			Varied Format Options		

Chapter 5: Optimization and derivative tools
Weeks 4-7
Project: Students will create a new map of the school that optimizes space in the hallways, distance between classes, yet maintains necessary structures. This will allow them to utilize their new derivative techniques including the product rule, quotient rule, and chain rule, to build the most efficient campus map.

Section	Lesson	Days	Lesson Objectives	Materials	Homework
5.1	5.1.1	1	Distance, Velocity, and Acceleration Functions	None	5-5 to 5-11
	5.1.2	1	Optimization	• Lesson 5.1.2 Res. Pgs. • Scissors and tape	5-14 to 5-20
	5.1.3	1	Using the 1st and 2nd Derivatives	None	5-25 to 5-32
	5.1.4	1	Applying the 1st and 2nd Derivative Tests	None	5-39 to 5-46
5.2	5.2.1	1	The Product Rule	None	5-51 to 5-58
	5.2.2	1	Chain Rule and Application: Part I	None	5-68 to 5-75
	5.2.3	1	Chain Rule and Application: Part II	None	5-79 to 5-86
	5.2.4	1	Quotient Rule: Two Proofs	None	5-93 to 5-99
	5.2.5	1	More Trigonometric Derivatives: $\tan x$, $\cot x$, $\sec x$, and $\csc x$	None	5-103 to 5-109
5.3	5.3.1	1	Optimization Problems: Part I	None	5-112 to 5-117
	5.3.2	1	Optimization Problems: Part II	None	5-122 to 5-127
	5.3.3	1	Optimization Problems: Part III	None	5-130 to 5-137
5.4	5.4.1	1	Chain Rule Extension of the Fundamental Theorem of Calculus	None	5-141 to 5-147
5.5 (BC)	5.5.1	1	Finding Limits of Indeterminate Forms	None	5-154 to 5-160
	5.5.2	1	Using l'Hôpital's Rule	None	5-167 to 5-173
Chapter Closure			Varied Format Options		

Chapter 6: More derivative tools
Weeks 8-11
Project (continued from Ch 5): Students will create a new map of the school that optimizes space in the hallways, distance between classes, yet maintains necessary structures. This will allow them to utilize their new derivative techniques including the product rule, quotient rule, and chain rule, to build the most efficient campus map.

Section	Lesson	Days	Lesson Objectives	Materials	Homework
6.1	6.1.1	1	Exponential Functions	• Posters from problem 1-4	6-8 to 6-16
	6.1.2	1	Derivatives of Exponential Functions	None	6-23 to 6-29
	6.1.3	1	Derivatives Using Multiple Tools	None	6-34 to 6-40
	6.1.4	1	Integrals of Exponential Functions	None	6-46 to 6-54
6.2	6.2.1	1	Implicit Differentiation	• Overhead graphing calculator (optional)	6-59 to 6-66
	6.2.2	1	Implicit Differentiation Practice	None	6-71 to 6-78
6.3	6.3.1	1	Inverse Trigonometric Derivatives	None	6-82 to 6-87
	6.3.2	1	Inverse Trigonometric Derivatives: The Formulas	None	6-91 to 6-96
	6.3.3	1	Derivatives of Natural Logarithms	None	6-101 to 6-106
	6.3.4	1	Derivatives of Inverse Functions	• Lesson 6.3.4 Res. Pg.	6-114 to 6-119
6.4	6.4.1	1	Mean Value	• Lesson 6.4.1 Res. Pg. • Interlocking cubes	6-125 to 6-133
	6.4.2	1	Mean Value Theorem	• Lesson 6.4.1 Res. Pg.	6-140 to 6-149
	6.4.3	1	Mean Value Theorem: Applications	None	6-158 to 6-163
6.5 (BC)	6.5.1	1	Improper Integrals	None	6-168 to 6-174
Chapter Closure			Varied Format Options		

Chapter 7: Related rates and integration tools
Weeks 12-15
Project: Students will select an independent research topic of choice to build a model of a related rates situation, through a 3D digital model, animation, and analysis.

Section	Lesson	Days	Lesson Objectives	Materials	Homework
7.1	7.1.1	1	Related Rates Introduction	• Yarn or String • Stapler and ruler	7-6 to 7-12
	7.1.2	1	Related Rates Application: The Pythagorean Theorem	None	7-17 to 7-24
	7.1.3	1	Related Rates Application: Similar Triangles	None	7-28 to 7-36
	7.1.4	1	Related Rates Application: Choosing the Best Formula	None	7-40 to 7-46
	7.1.5	1	Related Rates Application: Trigonometry	None	7-49 to 7-56
7.2	7.2.1	1	Undoing the Chain Rule	None	7-59 to 7-66
	7.2.2	1	Integration with *U*-Substitution	None	7-70 to 7-78
	7.2.3	1	Definite Integrals and *U*-Substitution	None	7-84 to 7-91
	7.2.4	1	Varied Integration Techniques	None	7-97 to 7-103
7.3	7.3.1	1	Solving Differential Equations	None	7-108 to 7-116
	7.3.2	1	The Soda Lab: Newton's Law of Cooling	• Thermometer or CBL with temperature probe • Cold soda	7-120 to 7-126
	7.3.3	1	Slope Fields with Parallel Tangents	• Lesson 7.3.3 A and B Res. Pgs.	7-132 to 7-139
	7.3.4	1	Slope Fields with Non-Parallel Tangents	• Lesson 7.3.4 A, B, and C Res. Pgs.	7-144 to 7-151
	7.3.5	1	Differential Equations and Slope Field Applications	None	7-156 to 7-164
Chapter Closure			Varied Format Options		

Chapter 8: Volume
Weeks 15-16
Project: Students will create a real-life model of the cross-sections of their 3D wire sculpture, originally built in September in their Art & Design class. They will use the slicing, shell, or cross-section method to find the volume of the art piece.

Section	Lesson	Days	Lesson Objectives	Materials	Homework
8.1	8.1.1	1	Volumes by Slicing	• Limes, lemons, hot dogs, potatoes, eggs, etc. • Plastic knives • Centimeter rulers	8-4 to 8-11
	8.1.2	1	The Disk Method	• Graphing calculators	8-18 to 8-24
	8.1.3	1	The Washer Method	• Graphing calculators	8-28 to 8-36
	8.1.4	1	Revolution About Horizontal and Vertical Lines	• Graphing calculators	8-41 to 8-48
	8.1.5	1	Revolving the same region About Various Lines.	• Graphing calculators	8-51 to 8-52
	8.1.6	1	Mixture of Disk and Washer Problems	• Graphing calculators	8-57 to 8-63
Chapter Closure			Varied Format Options		

Semester Review
Course Evaluation

Assessments:
Group Project Presentations
Final Exam

Further Readings:
Leithold, L. (1995). *The Calculus 7.* New York, NY: Harpercollins College Division.
Stewart, J. (2011). *Calculus.* Independence, KY: Brooks Cole.