



Manhattan Center for Science and Math High School

Mathematics Department Curriculum

Content/Discipline Calculus AB Term 2

<http://mcsportal.net>

Marking Period 1

Topic and Essential Question

Chapter 7 – (1) How is the integral used to find the area of a region under the curve? (2) How do we the volume of a solid with known cross sections, and the volumes of rotation? (3) How do we solve a free response questions involving the area between two curves and volume of a solid.

Unit/Topics

Unit #4 – Applications of Integrals (Chapter 7) and Free Response Questions (Chapter 7)

SWBAT/Objectives

Content (“Know”):

Chapter 7 – Applications of Integrals 25 days

- (1) Area between Curves
- (2) Volume of Solids
- (3) Surface of Revolution
- (4) Volume of Cross Section

Skills (“Do”):

Chapter 7 – Applications of Integrals 25 days

- (1) Students will be able to calculate are using the disc method and the area between curves.
- (2) Students will be able to calculate volume between the two curves with known cross sections.
- (3) Students will be able to calculate the volume of a cross section.

Vocabulary/Key Terms

Area under between two curves, Volume of a solid, Volumes of Rotation, Cross Sections.

Assessments:

- Classwork
- Lesson Summary
- Homework
- Warm-up (DO NOW) Quiz next day
- Tests
- Notebook Check once a week

- Portfolio Check at the end of each unit plan.

Common Core Standards:

F.IF.5, F.IF.6, F.IF.7, F.IF.8, F.IF.9, F.BF.1.

Common Core Standards for Math Practices:

- MP1: Make sense of problems and persevere in solving them.
- MP2: Reason abstractly and quantitatively.
- MP3: Construct viable arguments and critique the reasoning of others.
- MP4: Model with mathematics
- MP5: Use appropriate tools strategically
- MP6- Attend to precision
- MP7: Look for and make use of structure
- MP8- Look for and express regularity in repeated reasoning

Differentiated Instruction:

- Flexible grouping
- Cooperative Learning
- Visual Learning – SMART Board, White board
- Visual and interactive questions using the Smart board
- Students have an option to view additional videos, tutorials, interactive practice problems online through the class website, www.mszhao.com

ELLs:

- Students with ELL's will watch videos (the video has English and Spanish both versions) and additional tutorials about the lesson through the class website.
- Students are allowed extra time for works and assessments.



SWDs:

- Preview the Key Terms to give students access to context.
- Assign chapter summary to give less proficient readers access to content.

High-Achievers:

- ❖ Have gifted students assist students that are not as gifted.
- ❖ Ask students to take on leadership roles when working in groups.

Resources/Books

-  Graphing Calculator for individual use inside and outside of the classroom.
-  Larson, Hostetler, Edwards. Calculus of a single variable. The 8th edition. Houghton Mifflin Company, 2006

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- ✚ Multiple-Choice & Free-Response Questions in Preparation for the AP Calculus Examinations (AB), 8th Edition, 2003 by David Lederman.
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 - ✚ AP Central web site to find past free-response exams and AP Exam information. See [www. apcentral.collegeboard.com](http://www.apcentral.collegeboard.com).

Homework: Per Teacher



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Marking Period 2

Topic and Essential Question

Chapter 1-7 – (1) What is limits? (2) How do we find the derivative? (3) What is the application of derivative? (4) What is integration? (5) What is the application of the integration? (6) How do we find the derivative and antiderivative of the log and exponential functions? (7) How do we solve a differential equation? (8) How do we find the area and volume between two curves?

Unit/Topics

Review Chapter 1 – 7 (Multiple Choice Questions and Free Response Questions)

SWBAT/Objectives

Content (“Know”):

Review Chapter 1 – 7 (MCQ and FRQ)

Chapter 1 – Limit

(1) Review Interval Notation, (2) Predict Using Graphing Calculator, (3) Direct Substitution when Appropriate, (4) Infinite Limits, (5) One-Sided Limits, (6) Undefined Limits, (7) Continuous Functions, (8) Graphing Calculator/Table/Graphs to Solve Limit Problems, (9) Written Explanation

Chapter 2 – Derivative

(1) Definition of the derivative by using limit process, (2) Implicit Differentiation, (3) Rules of Differentiation: a) product/quotient; b)trigonometric; c) chain rule; d) sum/difference; e) higher order derivatives

Chapter 3 – Application of the derivative

(1) Introduction to the Antiderivative and the Integral, (2) Antiderivative Rules, (3) Integral of the Constant Function, (4)General/Initial/Particular Solutions, (5) One Day of Sigma Notation Review, (6) Approximating the Area Under a Curve Using Summation
(7) Definite integrals, (8) Average Value with an Integral, (9) Fundamental Theorems 1 & 2, (10) Area Under the Curve
(11) “U” substitution.

Chapter 4 – Integration

(1) Introduction to the Antiderivative and the Integral, (2) Antiderivative Rules, (3) Integral of the Constant Function, (4) General/Initial/Particular Solutions, (5) One Day of Sigma Notation Review, (6) Approximating the Area Under a Curve.

Chapter 5 – Logarithmic, Exponential and Trigonometric Functions

(1) Natural Logarithm Defined in Terms of the Integral, (2) Properties of the Natural Log, (3) Definition of the Natural Number e , (4) Derivative of the Natural Log, (5) Long Division of Polynomials (review before integration), (6) Integrals Involving Trig Functions, (7) Inverse Function (Review), (8) Natural Exponential Function & Derivative (e^x , $\ln x$ inverses of each other), (9) Derivative of Bases Other than e , (10) Limit Involving e .

Chapter 6 – Differential Equations

(1) Growth & Decay Models, (2) Separation of Variables/Particular Solutions, (3) Homogenous Solution, (4) Population, (5) Inverse Trigonometric Functions (Derivatives & Integrals), (6) Hyperbolic Functions.

Chapter 7 – Differential Equations

(1) Area between Curves, (2) Volume of Solids, (3) Surface of Revolution, (4) Volume of Cross Section

Skills (“Do”):

Chapter 1 – Limit

(1) Students will be able to find the limit of a function and determine if continuity exists by using traditional methods and technology.

Chapter 2 – Derivative

(1) Students will be able to apply rules of differentiation.
(2) Students will be able to find the derivative using the limit definition of a derivative.

Chapter 3 – Application of the derivative

(1) Students will be able to approximate the area under a curve using summations.
(2) Students will be able to find the definite integral of various functions.

Chapter 4 – Integration

(1) Students will be able to approximate the area under a curve using summations.
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Chapter 5 – Logarithmic, Exponential and Trigonometric Functions

(1) Students will be able to find integrals involving trig functions.
(2) Students will be able to derive the natural number, e , using limits.

Chapter 6 – Differential Equations

(1) Students will be able to solve a differential equation for the homogenous solution.
(2) Recognize and identify inverse trigonometric functions

Chapter 7 – Applications of Integrals

- (1) Students will be able to calculate area using the disc method and the area between curves.
- (2) Students will be able to calculate volume between the two curves with known cross sections.
- (3) Students will be able to calculate the volume of a cross section.

Vocabulary/Key Terms

Chapter 1 - Limits, Continuity, Discontinuity, infinity, One-sided limit.

Chapter 2 - Derivative, Quotient Rule, Product Rule, Power Rule, Chain Rule, Higher Order.

Chapter 3 - Antiderivative, Integral, Constant Function, General Solution, Initial Condition, Particular Solutions.

Chapter 4 - Sigma Notation, Definite integrals, Average Value of Function, Fundamental Theorems of Calculus I and II, Area Under a Curve.

Chapter 5 - Natural Logarithm, Natural Number e , Inverse Function.

Chapter 6 - Growth, Decay, Separation of Variables, Hyperbolic Functions.

Chapter 7 - Area under between two curves, Volume of a solid, Volumes of Rotation, Cross Sections.

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Common Core Standards:

F.IF.1, F.LE.2, F.LE.3, F.LE.4, F.LE.5, F.IF.6, F.IF.7, F.LE.8, F.LE.9, F.BF.1, F.LE.1b, A.SSE.4, F.BF. 2, N.VM.1, N.VM.2, N.VM.4a,b,c

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Homework: Per Teacher



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Marking Period 3

Topic and Essential Question

AP Calculus AB – (1) What is limits? (2) How do we find the derivative? (3) What is the application of derivative? (4) What is integration? (5) What is the application of the integration? (6) How do we find the derivative and antiderivative of the log and exponential functions? (7) How do we solve a differential equation? (8) How do we find the area and volume between two curves?

Individual Project = 1 Test Grade

AP Calculus PowerPoint

Unit/Topics

AP Calculus AB – (1) Letter to the Future AP Calculus Students, (2) Individual Project – PowerPoint (3) Group Project – Trifold or Book.

1. Letter to the Future AP Calculus AB Students = 1 Test Grade

In September, we started out as tiny caterpillars and we've transformed and refined ourselves in the last nine months. It might not seem like it, but yes, we've made it! This is a time to take the last nine months and reflect on it to future students of AP Calculus AB. The following is a guideline on how you can convey your experiences. Be positive and have fun!

I. Starting Out

- Your initial expectations of the class
- What you had problems with/what did you excel at?
- What is one necessity that is required to get through this course? (ex: calculator, fundamental theorem of calculus, best friend, flash cards, etc.)
- Was it everything you expected? If not why?
- Did you have to put more effort than expected and/or have more work than expected?

II. I Am a Changed Woman/ Man

- What were you able to take out of AP Calculus AB?
- How did you tackle the AP exam with your fullest potential?
- In general, how did you change/improve (self wise, academically, etc) just by taking this course? (This is a very ambiguous question, feel free to be specific based on your personal experiences).
- Benefits of taking this course?

III. Time Machine

- What was the most memorable event in Ms. Zhao's AP Calculus AB/BC class?
- If you can go back in time, name one thing you would have done differently.

IV. Conclusion

- Leave a positive note: words of encouragement
- Any secret techniques that you can reward the reader for getting to the end of your essay
- Study tips for incoming students

2. Individual Project - PowerPoint = 1 Test Grade

1. On your Individual Project - you are creating your own PowerPoint presentation to solve one of the former AP Free Response Questions. You must cover the topic Numerically, Graphically, Algebraically and Verbally. You must integrate Math Type and the Graphing Calculator into your PowerPoint Presentations or you can design a PowerPoint presentation on a topic you have studied during the whole school year of AP Calculus: such as, a) Derivatives; b) Optimization; c) Derivative at a point; d) Finding the volume of a solid..
2. You MUST be well-prepared for your presentation on Friday. Your presentation must be 3-4 minutes. You only have one chance to make it perfect. You must include the following aspects to receive a high grade: a) Creativity! b) Four perspectives (see above). c) BE SURE TO CHOSE YOUR QUESTION WISELY!
3. You must have minimum 8 slides and include citations on your last slide of PowerPoint.
4. The top ten PowerPoint Presentations will be chosen and posted on Ms. Zhao's Website!
5. Check your rubric and make sure your cover everything.
6. You must submit an electronic copy of your PowerPoint no later than _____. No late work will be accepted!
7. PowerPoint (Individual Project) = 1 TEST GRADE

3. Group Project – Trifold or Book = 1 Test Grade

Your Group Project can be a Trifold or Write a Calculus Book, see the instruction below:

I. Trifold Instruction:

1. You are going to CREATE an AP Calculus Free Response Question related to the REAL WORLD PROBLEM. You must cover the topic Numerically, Graphically, Algebraically and Verbally. You must integrate Math Type and the Graphing Calculator into your group project presentation.
2. You MUST be well-prepared for your presentation. You only have one chance to make it perfect. You must include the following aspects to receive a high grade: a) Creativity! b) Four perspectives (see above). c) BE SURE TO MAKE UP YOUR QUESTION WISELY!
3. You must have Title, Introduction, Definition, History of your topic, Examples, Methods, and References on your project.

II. Write a Calculus Book Instruction:

Book Guidelines: Booklet will contain minimum 3 -4 chapters and 10 pages. Use the equation editor in Microsoft Word to produce all equations.

Introduction - About the Author

- Include your picture, a short description about yourself, and your academic goals.

Chapter 1 - Limits and Continuity

- Your ideas must include what it means for a limit to exist, how limits fail to exist, a graphical understanding of limits, a numerical understanding of limits, and how limits impact the continuity of a function.

Chapter 2 - Derivatives

- Your ideas must include a graphical interpretation of a derivative, a numerical interpretation of a derivative, and analytical definition of a derivative. Include as many derivative rules as needed to explain your understanding of a derivative.

Chapter 3 – Antiderivatives

- Your ideas must include the relationship between a derivative and an antiderivative, indefinite integrals, definite integrals, and the accumulation function. You must include an approximation method that can be used to approximate a definite integral.

Chapter 4 - Application Problem

- Select at least one problem that shows how calculus can be applied to another field of science such as biology, physics, or chemistry.
- You may also create your own problem based upon one that you solved during the year to show how calculus can be used to solve a real life situation.

SWBAT/Objectives

Content (“Know”):

Chapter 1 – Limit

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