



Manhattan Center for Science and Math High School

Mathematics Department Curriculum

Content/Discipline Calculus AB/BC Term 1

<http://mcsportal.net>

Marking Period 1

Topic and Essential Question

Chapter 1 - (1) What is a limit? (2) How do we find limits? (3) How are limits calculated and how do they relate to continuity?

Chapter 2 - (1) What is a derivative? (2) How is the definition of the derivative by limit process? (3) How do you calculate the derivative of various types of functions?

Unit/Topics Unit #1 - Limits (Chapter 1) and Derivative Techniques (Chapter 2)

SWBAT/Objectives Content (“Know”):

Chapter 1 – Limit 12 days

(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 15 days

(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

Skills (“Do”):

Chapter 1 – Limit 12 days

(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 15 days

(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.

Vocabulary/Key
Terms

Limits, Continuity, Discontinuity, infinity, One-sided limit, Derivative, Quotient Rule, Product Rule, Power Rule, Chain Rule, Higher Order.

Assessments:

- Unit Test / Quiz
- 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.7 , F.LE.1, F.LE.2, F.LE.3, F.LE.4, F.IF.8

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
- + Multiple-Choice & Free-Response Questions in Preparation for the AP Calculus Examinations (AB), 8th Edition, 2003 by David Lederman.
- + Fast Track to a 5: preparing for the AP calculus AB and Calculus BC Examinations, by Sharon Cade, Jeff Lucia, and Rhea Caldwell.
- + AP Calculus Preparing for the Advanced Placement Examination, 2000 by Jmes F. Bohan, AMSCO. There are 5 complete model Exams, Review exercises and chapter assessments, use of graphing calculators and complete answer key with solutions.
- + AP Central web site to find past free-response exams and AP Exam information. See www.apcentral.collegeboard.com.

Homework: Per Teacher



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Marking Period 2

Topic and Essential Question

Chapter 3 - (1) How are equations solved when derivatives are used as variables? (2) How do you use Euler's method when the differential equation cannot be solved exactly? (3) How do you model rates of change?

Chapter 4 - (1) What are the different ways you can use Riemann Sums to approximate area under a curve and how is that related to integration? (2) What is a definite integral? (3) How are definite integrals like limits?

Unit/Topics

Unit #2 - Applications of Differentiation (Chapter 3) and Integration (Chapter 4)

SWBAT/Objectives

Content ("Know"):

Chapter 3 – Application of the derivative 20 days

- (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 10 days

- (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.

Skills ("Do")

Chapter 3 – Application of the derivative 20 days

- (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 10 days

- (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.

Vocabulary/Key Terms

Antiderivative, Integral, Constant Function, General Solution, Initial Condition, Particular Solutions, Sigma Notation, Definite integrals, Average Value of Function, Fundamental Theorems of Calculus I and II, Area Under a Curve.

Assessments:**Unit Test / Quiz**

- 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.4 , F.IF.5 ,F.IF.6 , F.IF.7, F.IF.8 , F.IF.9 , F.BF.1, F.LE.1b

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Marking Period 3

Topic and Essential Question

Chapter 5 - (1) How do you decide which method of integration to use to solve integrals? (2) How do you evaluate improper integrals including the use of L'Hôpital's rule? (3) How and why do you use a geometric interpretation of differential equations via slope fields? (4) What is the relationship between slope fields and the derivatives of implicitly defined functions?

Chapter 6 - (1) How do you compute the total change in a function from its rate of change? (2) How do you use the concept of an anti-derivative and given initial conditions to solve rectilinear motion problems?

Unit/Topics Unit #3 – Differentiation and Integration for Logarithmic, Exponential and Other Transcendental Functions (Chapter 5) and Differential Equations (Chapter 6)

SWBAT/Objectives Content (“Know”):

Chapter 5 – Logarithmic, Exponential and Trigonometric Functions 15 days

(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 15 days

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

Skills (“Do”):

Chapter 5 – Logarithmic, Exponential and Trigonometric Functions 15 days

(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 15 days

(1) Students will be able to solve a differential equation for the homogenous solution.

(2) Recognize and identify inverse trigonometric functions

Vocabulary/Key Terms

Natural Logarithm, Natural Number e , Inverse Function, Growth, Decay, Separation of Variables, Hyperbolic Functions.

Assessments:

Unit Test / Quiz

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