

MANCHESTER REGIONAL
HIGH SCHOOL



ADVANCED PLACEMENT
CALCULUS

Revised and Adopted

May, 2016

Manchester Regional High School Board of Education

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**Manchester Regional High School
District Mission Statement**

The mission of Manchester Regional High School is to produce respectful, responsible and well-rounded graduates who possess the knowledge and skills to become contributing members of society and life-long learners.

Highly qualified, collaborative and innovative staff address the needs of a diverse school community in a stimulating and nurturing environment.

AP Calculus AB - Syllabus

Textbook

Calculus —Graphical, Numerical, Algebraic. 3rd edition, by Finney, Demana, Waits, and Kennedy. Pearson Education Publishing, Pearson Prentice-Hall, Boston, Massachusetts. ©2007.

Course Overview

This course covers all topics as in the *AP Calculus Course Description* so as to prepare students to take the AP Calculus exam. Students will learn, understand and apply limits, differentiation, and integration. In addition to rote memorization, an axiomatic approach to theorems will enable students to work problems that they have not previously seen. As such, this course provides a solid foundation so as to succeed in future math courses. Topics are as described in the Course Outline

presented below.

Course Outline

| | | | # Days |
|-----------------------------------|-----------------------------------|--|--------|
| Chapter 1 - Prerequisites | | | |
| • 1-3 | Exponential Functions | | 2 |
| • 1-4 | Parametric Equations | | 2 |
| • 1-5 | Functions and Logarithms | | 2 |
| • 1-6 | Trigonometric Functions | | 2 |
| Sub-Total Days | | | 8 |
| Chapter 2 - Limits and Continuity | | | |
| • 2-1 | Rates of Change and Limits | | 2 |
| • 2-2 | Limits Involving Infinity | | 2 |
| • 2-3 | Continuity | | 2 |
| • 2-4 | Rates of Change and Tangent Lines | | 2 |

| | | | |
|---------------------------------------|--|---------------------|--------|
| | Review and Test | | 2 |
| Sub-Total Days | | | 10 |
| Chapter 3 - Derivatives | | | |
| • 3-1 | Derivative of a Function | | 3 |
| • 3-2 | Differentiability | | 3 |
| • 3-3 | Rules for Differentiation | | 3 |
| • 3-4 | Velocity and Other Rates of Change | | 3 |
| • 3-5 | Derivatives of Trigonometric Functions | | 3 |
| • 3-6 | Chain Rule | | 3 |
| • 3-7 | Implicit Differentiation | | 3 |
| • 3-8 | Derivatives of Inverse Trigonometric Functions | | 3 |
| • 3-9 | Derivatives of Exponential and Logarithmic Functions | | 3 |
| | Review and Test | | 3 |
| Sub-Total Days | | | 30 |
| Chapter 4 - Derivatives: Applications | | | |
| • 4-1 | Extreme Values of Functions | | 2 |
| • 4-2 | Mean Value Theorem | | 3 |
| • 4-3 | Connecting f' and f'' with graph of f | | 3 |
| • 4-4 | Modeling and Optimization | | 3 |
| | | | # Days |
| • 4-5 | Linearization | NOT Newton's Method | 3 |
| • 4-6 | Related Rates | | 3 |

| | | | |
|--|---|---|----|
| | Review and Test | | 3 |
| Sub-Total Days | | | 20 |
| Chapter 5 - The Definite Integral | | | |
| • 5-1 | Estimating with Finite Sums | | 3 |
| • 5-2 | Definite Integrals | | 4 |
| • 5-3 | Definite Integrals and Antiderivatives | | 4 |
| • 5-4 | Fundamental Theorem of Calculus | | 4 |
| • 5-5 | Trapezoidal Rule | | 3 |
| | Review and Test | | 2 |
| Sub-Total Days | | | 20 |
| Chapter 6 - Differential Equations and Mathematical Modeling | | | |
| • 6-1 | Slope Fields and Euler's Method | Separation of variables | 4 |
| • 6-2 | Antidifferentiation by Substitution | | 5 |
| • 6-4 | Exponential Growth and Decay | | 4 |
| | Review and Test | | 3 |
| Sub-Total Days | | | 16 |
| Chapter 7 - Definite Integrals: Applications | | | |
| • 7-1 | Integral as Net Change | | 3 |
| • 7-2 | Areas in the Plane | | 3 |
| • 7-3* | Volumes | Disk/washer method only, NOT shell method | 3 |
| • 7-4 | Lengths of Curves | | 3 |
| • 7-5 | Applications for Science and Statistics | | 3 |
| | Review and Test | | 3 |
| Sub-Total Days | | | 18 |

| | | | |
|-----------------------------------|-----------------------------------|--|-----|
| AP Exam Review | | | |
| Sub-Total Days | | | 25 |
| Additional Topics (after AP exam) | | | |
| • 4-5 | Newton's Method | | 2 |
| • 6-3 | Integration by Parts | | 3 |
| • 6-5 | Logistic Growth | | 2 |
| • 7-3 | Volumes: Shell Method | | 2 |
| • 7-5 | Work Problems | | 2 |
| • 8-2 | L'Hopital's Rule | | 2 |
| • Appendix A3 | ϵ - δ Limit Proof | | 2 |
| • 9-1 | Power Series (if time permits) | | 2 |
| • 9-2 | Taylor Series (if time permits) | | 2 |
| Sub-Total Days | | | 19 |
| TOTAL DAYS | | | 166 |

Teaching Strategies

- Chapter sections consist of one day for lecture, followed by two days of practice. Students will have opportunities to work alone and in small groups.
- Daily homework will be assigned from textbook, including Quick Review problems to spiral previously learned material. Each day, as I check homework, students identify specific homework problems they need assistance with and I solicit volunteers to share their work on the board and explain their results.
- Students will receive weekly extension problems that require them to show their work and explain their solutions in written sentences.

- Assessments, administered at the end of each chapter, will include both calculator and non-calculator activities. They will also include sample AP exam questions when appropriate.
- Throughout the year, information that pertains to the AP Calculus test will be presented. Administration, scoring, and AP exam content (especially released AP exam questions) will be presented, as well as specific calculator strategies to avoid rounding issues and other common errors.

Technology and Computer Software

- All students have been issued TI-nspire graphing calculators with TI-84 skins. We use them regularly to confirm results achieved using algebraic methods and to explore students' curiosity.
- Visual aids will allow students to “see” the concept. Visual aids include the use of Desmos Online Graphing Calculator, YouTube content, and other online resources shared in class and via Google Classroom.
- Students will use a graphing calculator to find the value of a derivative at a point, to find the value of a definite integral, to find an appropriate viewing window for any function, and to solve an equation, i.e. find roots. They will be assigned various graphing calculator investigative labs at regular intervals throughout the course.