P.S. 035 Manhattan High School Course Syllabus

Course Code: MCS21XQR
Course Name: AP Calculus BC
Teacher Name: Roberts
Year and Term: 2020/1

Learning Standards:

A-SSE Seeing Structure in Expressions
NRN The Real Number System
A-CED Creating Equations
F-IF Interpreting Functions
F-BF Building Functions
A-REI Reasoning with Equations and Inequalities
A-APR Arithmetic with Polynomials & Rational Expressions
F-LE Linear, Quadratic, & Exponential Models

Course Description:

This course covers the standard first year of college-level calculus, including limits, derivatives and their applications, integrals and their applications, differential equations, parametric equations, polar coordinates, and infinite sequences and series. We will cover the first eleven chapters of Stewart's classic book.

Calendar or Unit Map:

1. Functions and Models
1.1. Four Ways to Represent a Function
1.2. Mathematical Models: A Catalog of Essential Functions
1.3. New Functions from Old Functions
1.4. Exponential Functions
1.5. Inverse Functions and Logarithms

2. Limits and Derivatives
2.1. The Tangent and Velocity Problems
2.2. The Limit of a Function
2.3. Calculating Limits Using the Limit Laws
2.4. The Precise Definition of a Limit
2.5. Continuity
2.6. Limits at Infinity; Horizontal Asymptotes
2.7. Derivatives and Rates of Change
2.8. The Derivative as a Function

3. Differentiation Rules
3.1. Derivatives of Polynomials and Exponential Functions
3.2. The Product and Quotient Rules
3.3. Derivatives of Trigonometric Functions

3.4. The Chain Rule
3.5. Implicit Differentiation
3.6. Derivatives of Logarithmic Functions
3.7. Rates of Change in the Natural and Social Sciences
3.8. Exponential Growth and Decay
3.9. Related Rates
3.10. Linear Approximations and Differentials
3.11. Hyperbolic Functions

4. Applications of Differentiation
4.1. Maximum and Minimum Values
4.2. The Mean Value Theorem
4.3. How Derivatives Affect the Shape of a Graph
4.4. Indeterminate Forms and l'Hospital's Rule
4.5. Summary of Curve Sketching
4.6. Graphing with Calculus and Calculators
4.7. Optimization Problems 4.8. Newton's Method
4.9. Antiderivatives

5. Integrals
5.1. Areas and Distances
5.2. The Definite Integral
5.3. The Fundamental Theorem of Calculus Parts 1 and 2
5.4. Indefinite Integrals and the Net Change Theorem
5.5. The Substitution Rule

6. Applications of Integration
6.1. Areas Between Curves
6.2. Volumes
6.3. Volumes by Cylindrical Shells
6.4. Work
6.5. Average Value of a Function

7. Techniques of Integration
7.1. Integration by Parts
7.2. Trigonometric Integrals
7.3. Trigonometric Substitution
7.4. Integration of Rational Functions by Partial Fractions
7.5. Strategy for Integration
7.6. Integration Using Tables and Computer Algebra Systems
7.7. Approximate Integration
7.8. Improper Integrals

8. Further Applications of Integration
8.1. Arc Length
8.2. Area of a Surface of Revolution

8.3. Applications to Physics and Engineering
8.4. Applications to Economics and Biology
8.5. Probability

9. Differential Equations
9.1. Modeling with Differential Equations
9.2. Direction Fields and Euler's Method
9.3. Separable Equations
9.4. Models for Population Growth
9.5. Linear Equations
9.6. Predator-Prey Systems

10. Parametric Equations and Polar Coordinates
10.1. Curves Defined by Parametric Equations
10.2. Calculus with Parametric Curves
10.3. Polar Coordinates
10.4. Areas and Lengths in Polar Coordinates
10.5. Conic Sections
10.6. Conic Sections in Polar Coordinates

11. Infinite Sequences and Series
11.1. Sequences
11.2. Series
11.3. The Integral Test and Estimates of Sums
11.4. The Comparison Tests
11.5. Alternating Series
11.6. Absolute Convergence and the Ratio and Root Tests
11.7. Strategy for Testing Series
11.8. Power Series
11.9. Representations of Functions as Power Series
11.10. Taylor and Maclaurin Series
11.11. Applications of Taylor Polynomials

Course Materials:

Calculus (Stewart). James Stewart. 8th ed. National Geographic/Cengage Learning.
Graphing Calculator
Notes Handouts

Grading Policy:

50% Homework
50% Exams
As per the school grading policy, all grades will be numerical, with the exception of incomplete grades and students auditing the course. Any students who receive an incomplete will be given makeup work to complete by the term following the end of the course. This work will then be graded and averaged together with the work completed during the course to compose a final numerical grade.

Other Expectations:

If you do not turn in assignments on time I may assign make-up assignments at my discretion, which will comprise of workbook pages and/or online exercises. These assignments are due before the end of the marking period in which they were originally assigned, except for newly admitted students, who have until the end of the following term to complete them.

Remember to contact me asap if you have any questions about anything! My email is aroberts16@schools.nyc.gov. Also, if you ever need anything, feel free to see me during a free period, or during your lunch, and I will do whatever I can.