**Calculus**

**Syllabus**

Textbook: Calculus for the AP Course (3rd edition) by Michael Sullivan & Kathleen Miranda, Copyright 2020, 2017, 2014 by W.H. Freeman and Company

**Unit I: Limits and Continuity**

1. **Limits of Functions Using Numerical and Graphical Techniques**
2. **Analytic Techniques for Finding Limits of Functions**
3. **Continuity**
4. **Limits and Continuity of Trigonometric, Exponential, and Logarithmic Functions**
5. **Infinite Limits; Limits at Infinity; Asymptotes**

**Unit II: Differentiation: Definition and Fundamental Properties**

1. **Rates of Change and the Derivative**
2. **The Derivative as a Function; Differentiability**
3. **The Derivative of a Polynomial function and**

**The Derivative of y =** $e^{x}$

1. **Differentiating the Product and the Quotient of Two Functions; Higher-Order Derivatives**
2. **The Derivative of the Trigonometric Functions**

**Unit III: Differentiation: Composite, Implicit, and Inverse Functions**

1. **The Chain Rule**
2. **Implicit Differentiation**
3. **Derivatives of the Inverse Trigonometric Functions**
4. **Derivatives of Logarithmic Functions**

**Unit IV: Applications of the Derivative-Part 1**

1. **Interpreting a Derivative**
2. **Differentials: Linear Approximations; Newton’s Method**
3. **Related Rates**
4. **Indeterminate Forms and L’Hopital’s Rule**

**Unit V: Applications of the Derivative-Part 2**

1. **Maximum and Minimum Values; Critical Numbers**
2. **The Mean Value Theorem**
3. **Local Extrema and Concavity**
4. **Using Calculus to Graph Functions**
5. **Optimization**
6. **Antiderivatives; Differential Equation**

**Unit VI: The Integral-Part 1**

1. **Area**
2. **The Definite Integral**
3. **The Fundamental Theorem of Calculus**
4. **Properties of the Definite Integral**
5. **The Indefinite Integral; Method of Substitution**

 **Techniques of Integration-Part 2**

1. **Integration by Parts**
2. **Integrals Containing Trigonometric Functions**
3. **Integration Using Trigonometric Substitution: Integrands containing** $\sqrt{a^{2}-x^{2} }$**,** $\sqrt{x^{2}+a^{2} }$**, or** $\sqrt{x^{2}-a^{2} }$ **, a>0**
4. **Integrands containing** $ax^{2}+bx+c, a\ne 0$**; Integrate Using Long Division**
5. **Integration of Rational Functions Using Partial Fractions**
6. **Approximating Integrals; Trapezoidal Sums, the Midpoint Rule, Simpson’s Rule**
7. **Improper Integrals**
8. **Integration Using Tables and Computer Algebra Systems**
9. **Mixed Practice (Assess Your Understanding)**

**Unit VII: Differential Equations**

1. **Classification of Ordinary Differential Equations**
2. **Separable First-Order Differential Equations; Uninhibited and Inhibited Growth and Decay Models**
3. **Slope Fields**
4. **Euler’s Method**
5. **The Logistic Model**

**Unit VIII: Applications of Integration**

1. **Area between Graphs**
2. **Volume of a Solid of Revolution: Disks and Washers**
3. **Volume of a Solid of Revolution: Cylindrical Shells**
4. **Volume of a Solid: Slicing**
5. **Arc Length**
6. **Work**

**Practice Exam: Calculus AB**