Sample Syllabus 4 Contents

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Curricular Requirements

CR1a The course is structured around the enduring understandings within Big Idea 1: Limits.
- See page 1

CR1b The course is structured around the enduring understandings within Big Idea 2: Derivatives.
- See pages 1, 3

CR1c The course is structured around the enduring understandings within Big Idea 3: Integrals and the Fundamental Theorem of Calculus.
- See pages 4, 5

CR1d The course is structured around the enduring understandings within Big Idea 4: Series.
- See pages 8, 9

CR2a The course provides opportunities for students to reason with definitions and theorems.
- See pages 2, 3

CR2b The course provides opportunities for students to connect concepts and processes.
- See page 6

CR2c The course provides opportunities for students to implement algebraic/computational processes.
- See page 4

CR2d The course provides opportunities for students to engage with graphical, numerical, analytical, and verbal representations and demonstrate connections among them.
- See pages 2, 6, 7

CR2e The course provides opportunities for students to build notational fluency.
- See page 6

CR2f The course provides opportunities for students to communicate mathematical ideas in words, both orally and in writing.
- See pages 2, 3

CR3a Students have access to graphing calculators.
- See page 1

CR3b Students have opportunities to use calculators to solve problems.
- See page 4

CR3c Students have opportunities to use a graphing calculator to explore and interpret calculus concepts.
- See page 2

CR4 Students and teachers have access to a college-level calculus textbook.
- See page 1

AP CALCULUS BC SYLLABUS

Primary Textbook:

Larson, R. and Bruce H. Edwards. *Calculus of a Single Variable*. 10th ed. Boston: Brooks/Cole, 2006. **[CR4]**

[CR4] — Students and teachers have access to a college-level calculus textbook.

Supplemental Material:

Anton, Howard. *Calculus: A New Horizon.* New York: John Wiley & Sons, Inc., 1998.

Stewart, James. *Single Variable Calculus: Concepts and Contexts.* Boston: Brooks/Cole, 2011.

AP Central resources.

Graphing Calculators:

Each student is required to purchase a TI-84 graphing calculator. If they cannot purchase one, the school will provide calculators for students to borrow for the school year. Students are also required to bring their calculators to class daily. **[CR3a]**

[CR3a] — Students have access to graphing calculators.

The following are highlights of each unit, which include an overview of the content covered, the sections from the textbook where some problem sets are assigned, and a snapshot of problems found in homework, classroom discussion, and assessments. Sample activities are listed as either graphing calculator active (CA) or inactive (IA).

Unit 1: Limits, Continuity, and Derivatives (15 days) [CR1a] [CR1b: derivatives]

- Understand the limit definition and symbolic representation of a limit.
- From a given graph, evaluate a limit at a point. Include one-sided limits.
- Use numeric and graphic information with and without the graphing calculator to estimate a limit. Include one-sided limits, limits at $+/-$ infinity, and functions that are unbounded, oscillating, and contain two different one-sided limits.
- Use limit theorems to evaluate limits analytically, including limits of piecewise functions.
- Evaluate limits analytically. Include finding limits of sums, differences, products, quotients, and composite functions that use limit theorems and algebraic rules.
- Evaluate the limit of a function involving algebraic manipulation, special trig functions, and apply the squeeze theorem.
- Use one-sided limits to recognize and find vertical asymptotes.
- Use limits as x tends toward $+/-$ infinity to recognize and find horizontal asymptotes.
- Sketch a function given a set of limit conditions.
- Use limits to describe asymptotic and unbounded behavior.
- Explore continuity visually, and understand and apply the definition of continuity.
- Explore different types of discontinuity (i.e., removable, jump, infinite) using the graphing calculator.
- Determine types of discontinuity analytically. Include polynomial, rational, power, exponential, logarithmic, and trigonometric functions.
- Visually understand the difference between average rate of change and instantaneous rate of change.

- Recognize and use difference quotients when evaluating average rate of change, average velocity, average acceleration, and approximation of slope or derivative.
- Make connection between the limit of the difference quotient and rate of change at a point.
- Recognize the use of the limit of difference quotients. Use the limit of difference quotients when evaluating rate of change, slope of tangent line, velocity, acceleration, or derivative value at a point.
- Define a derivative using limits. Understand the multiple notations for representing derivatives.
- Find equations of tangent and normal lines.
- Use linear approximations to approximate a function's value at a point.
- Find derivatives by the power, product, quotient, and chain rules.
- Use the graphing calculator to find derivative of a function at a given point.

[CR1a] — The course is structured around the enduring understandings within Big Idea 1: Limits.

[CR1b] — The course is structured around the enduring understandings within Big Idea 2: Derivatives.

Textbook Section and Section Title

1.2 Finding Limits Graphically and Numerically

1.3 Evaluating Limits Analytically

1.4 Continuity and One-Sided Limits

1.5 Infinite Limits

2.1 The Derivative and the Tangent Line Problem

2.2 Basic Differentiation Rules and Rates of Change

2.3 Product and Quotient Rules and Higher-Order Derivatives

2.4 The Chain Rule

3.9 Differentials

Sample Activity: Students work on the following problems in pairs, and are then chosen at random to present their solutions orally to the class and defend their reasoning. **[CR2f]**

IA: 1. Let a be a non-zero value and $g(t) = \begin{cases} \frac{t^2-a}{t-\sqrt{a}}, t \neq \sqrt{a} \\ t + \sqrt{a}\ t = \sqrt{a} \end{cases}$

a) Is $g(t)$ defined at $t = \sqrt{a}$? If so, what is its value? Use the definition of a function to show the analysis that leads to your conclusion.

b) Does the limit exist at $t = \sqrt{a}$? If so, what is its value? Use the definition of a limit to show the analysis that leads to your conclusion**. [CR2a]**

c) For what values will $g(t)$ be continuous on all the reals? Use the definition of continuity to show the analysis that leads to your conclusion**. [CR2a]**

IA: 2. Graph the functions $y = sin(1/x)$ and $y = xsin(1/x)$ on your calculator, and use both the graphs and the table feature to explore whether these functions are continuous at $x = 0$. **[CR2d: graphical and numerical] [CR3c]**

[CR2f] — The course provides opportunities for students to communicate mathematical ideas in words, both orally and in writing.

[CR2a] — The course provides opportunities for students to reason with definitions and theorems.

[CR2d] — The course provides opportunities for students to engage with graphical, numerical, analytical, and verbal representations and demonstrate connections among them.

[CR3c] — Students have opportunities to use a graphing calculator to explore and interpret calculus concepts.

Unit 2: Derivative Applications and the Mean Value Theorem (14 days) [CR1b: Mean Value Theorem]

- Define and apply the Intermediate Value Theorem, Extreme Value Theorem, and Mean Value Theorem.
- Explore the connection between continuity and differentiability.
- Determine differentiability of a variety of functions using limits.
- Using a variety of notations, find higher-order derivatives.
- Use the first derivative to determine critical points, horizontal and vertical tangent lines, intervals of increase or decrease, and relative (local) extrema.
- Find absolute (global) extrema.
- Use the second derivative to determine intervals of upward/downward concavity and points of inflection.
- Solve rectilinear motion problems involving position, speed, velocity, and acceleration.
- Given various representations of f'or f'' (e.g., by graph, table, and formula), state the relationship these functions have to the function f and sketch a possible graph of f.
- Use the graphing calculator to graph f' or $f'$to find critical points; horizontal and vertical tangent lines; intervals of increase or decrease; and relative (local) extrema, concavity, and points of inflection.
- Use the graphing calculator to confirm characteristics (e.g., concavity) of graphs of functions.
- Explore and apply the second derivative test for relative extrema.

[CR1b] — The course is structured around the enduring understandings within Big Idea 2: Derivatives.

Textbook Section and Section Title

2.1 The Derivative and the Tangent Line Problem

3.1 Relative Extrema and Critical Numbers

3.2 Rolle's Theorem and The Mean Value Theorem

3.3 Increasing and Decreasing Functions and the First Derivative Test

3.4 Concavity and the Second Derivative Test

3.5 Limits at Infinity

3.6 A Summary of Curve Sketching

Sample Activity: Students work out the following as a homework assignment and turn in their written work the next day in class.

IA: 1. Let f be the function given by $f(x) = x^3$. Find a positive real number r having the property that there must exist a value c with $-1 < c < 2$ and $f'(c) = r$. Which theorem did you apply to this situation and why? Explain your answer in well-written sentences. **[CR2a] [CR2f: written]**

[CR2a] — The course provides opportunities for students to reason with definitions and theorems.

[CR2f] — The course provides opportunities for students to communicate mathematical ideas in words, both orally and in writing.

Unit 3: Derivative Applications and Modeling (10 days)

- Use implicit differentiation to find dy/dx, and the locations of vertical and horizontal tangents.
- Use implicit differentiation to find d^2y/dx^2 and to determine a curve's concavity at a certain point.
- Identify variables, constants, and rates of change, and represent these symbolically in related rate word problems. Find an unknown rate of change relating the given information.
- Use a derivative to solve optimization problems.

Textbook Section and Section Title

2.5 Implicit Differentiation

2.6 Related Rates

3.7 Optimization Problems

Sample Activity: Students work out the following problems as homework, then exchange papers and correct one another's work the next day in class.

CA: 1. For time $t \geq 0$, let $r(t) = 120(1 - e^{-10t^2})$ represent the speed, in kilometers per hour, at which a car travels along a straight road. The number of liters of gasoline used by the car to travel x kilometers is modeled by $g(x) = 0.05x(1 - e^{-x/2})$.

Use your calculator to find the rate of change with respect to time of the number of liters of gasoline used by the car when $t = 2$ hours if the car traveled 206.370 kilometers in the first two hours. Indicate units of measure. **[CR3b]**

IA: 1. Consider the curve defined by $2y^3 + 6x^2y - 12x^2 + 6y = 1$.

a) Find dy/dx. **[CR2c]**

b) Write an equation of each horizontal tangent line to the curve.

[CR3b] — Students have opportunities to use calculators to solve problems.

[CR2c] — The course provides opportunities for students to implement algebraic/computational processes.

Unit 4: Integrals and Applications (16 days) [CR1c: integrals]

- Translate the symbolic representation of the definite integral to a graphical representation.
- Make a connection between the definite integral and area. Calculate the definite integrals of linear functions over a given interval using geometry.
- Formulate and use properties of definite integrals. Include the integral of a constant times a function, the integral of the sum of two functions, reversal of limits of integration, and the integral of a function over adjacent intervals.
- Use the graphing calculator to explore a Riemann sum with different partition sizes on non-linear functions. Define the definite integral as a limit of a Riemann sum.
- From functions represented graphically, numerically, algebraically, and verbally, use a left Riemann sum, a right Riemann sum, and a midpoint Riemann sum with different partition sizes to find approximations for definite integrals.

- From functions represented graphically, numerically, algebraically, and verbally, use a trapezoidal sum with different partition sizes to find approximations for definite integrals.
- Recognize a limit of a Riemann sum as the definite integral and translate to its symbolic form.
- Define and use the process of antidifferentiation to find the expression of an indefinite integral. Develop techniques for finding antiderivatives by algebraic manipulation and substitution of variables.
- Understand and use the Fundamental Theorem of Calculus [If f is continuous on $[a, b]$, then $\int_a^b f(x)dx = F(b) - F(a)$] to evaluate definite integrals. Use the graphing calculator to perform numerical integration. **[CR1c: Fundamental Theorem of Calculus part 2]**
- Understand and use the other part of the Fundamental Theorem of Calculus [If f is continuous on $[a, b]$ then the function g defined by $g(x) = \int_a^x f(t)dt$ is an antiderivative of f. That is, $g'(x) = f(x)$ for $a < x < b$]. **[CR1c: Fundamental Theorem of Calculus part 1]**
- Apply definite integrals to problems involving average value.
- Use a definite integral to define new functions such as $f(x) = \int_0^x t^2 dt$.
- Apply given conditions to finding function values for indefinite integrals.
- Given a graphical, numerical, analytical, or verbal representation of a function defined as $g(x) = \int_a^x f(t)dt$, form conclusions about the function $g(x)$.
- In rectilinear motion over an interval of time, determine displacement, distance, or speed.
- In rectilinear motion with initial conditions given, use antiderivatives to find position or velocity.
- Find the derivative of a function's inverse, provided the derivative exists.
- Find the derivative and antiderivative of inverse trigonometric functions.

[CR1c] — The course is structured around the enduring understandings within Big Idea 3: Integrals and the Fundamental Theorem of Calculus.

Textbook Section and Section Title

4.1 Antiderivative and Indefinite Integration

4.2 Area

4.3 Riemann Sums and Definite Integrals

4.4 The Fundamental Theorem of Calculus (both parts)

4.5 Integration by Substitution

4.6 Numerical Integration

5.3 Inverse Functions

5.6 Inverse Trigonometric Functions: Differentiation

5.7 Inverse Trigonometric Functions: Integration

Sample Activity: Students work out the following problems as part of an in-class exam.

CA: 1. A scientist measures the depth of the Doe River at Picnic Point. The river is 24 feet wide at this location. The measurements are taken in a straight line perpendicular to the edge of the river. The data are shown in the following table. The velocity of the water at Picnic Point, in feet per minute, is modeled by $v(t) = 16 + 2\sin(\sqrt{t + 10})$ for $0 \le t \le 120$ minutes.

Distance from the river's edge (feet):	0	8	14	22	24

Depth of the water (feet):	0	7	8	2	0

a) Use a trapezoidal sum with four subintervals indicated by the data in the table to approximate the area of the cross section of the river at Picnic Point in square feet. Show the computations that lead to your answer. **[CR2d: verbal and numerical]**

b) The volumetric flow at a location along the river is the product of the cross-sectional area and the velocity of the water at that location. Use your approximation from part (a) to estimate the average value of the volumetric flow at Picnic Point, in cubic feet per minute, from $t = 0$ to $t = 120$ minutes. **[CR2b]**

c) The scientist proposes the function f, given by $f(x) = 8\sin(\frac{\pi x}{24})$, as a model for the depth of the water, in feet, at Picnic Point x feet from the river's edge. Find the area of the cross section of the river at Picnic Point based on this model.

d) Recall that the volumetric flow is the product of the cross-sectional area and the velocity of the water at a location. To prevent flooding, water must be diverted in the average value of the volumetric flow at Picnic Point exceeding 2100 cubic feet per minute for a 20-minute period. Using your answer from part (c), find the average value of the volumetric flow during the time interval $40 \le t \le 60$ minutes. Does this value indicate that the water must be diverted? **[CR2b] [CR2d: connection between analytical and verbal]**

IA: 1. Consider the finite region in the first quadrant bounded by the curves $y = 4x$ and $y = x^4$. Write a limit of a right-hand Riemann sum equal to the area of this region. Then use the Fundamental Theorem of Calculus to compute the area. **[CR2e]**

[CR2d] — The course provides opportunities for students to engage with graphical, numerical, analytical, and verbal representations and demonstrate connections among them.

[CR2b] — The course provides opportunities for students to connect concepts and processes.

[CR2e] — The course provides opportunities for students to build notational fluency.

Unit 5: Logs and Exponents (15 days)

- Use the graphing calculator to draw a slope field and draw a solution curve on a slope field.
- Use a slope field to obtain visual clues to behavior of solutions to first order differential equations.
- Use Euler's method to approximate the particular solution of a differential equation.
- Solve separable first order differential equations and show the solution includes a family of functions. Reinforce with slope fields and verify with derivatives.
- Solve separable first order differential equations with initial conditions to show a particular solution; check for domain restrictions.
- Understand continuity and differentiability when working with logarithmic and exponential functions.
- Apply derivative rules to find derivatives and solve applications involving logarithmic and exponential functions.
- Apply antiderivative rules involving logarithmic and exponential functions.
- Solve application problems involving logarithmic and exponential functions involving antiderivatives, integration, and the definite integral.
- Evaluate definite integrals by changing limits of integration.
- Use integration by parts to find an antiderivative and to evaluate a definite integral.
- Use partial fraction decomposition to find an antiderivative and to evaluate a definite integral.

- Use antidifferentiation to solve application problems involving exponential growth.
- Analyze the logistic curve to obtain information about growth, rate of growth, and carrying capacity.

Textbook Section and Section Title

5.1 The Natural Logarithmic Function: Differentiation

5.2 The Natural Logarithmic Function: Integration

5.4 Exponential Functions: Differentiation and Integration

5.5 Bases Other than e and Applications

6.1 Slope Fields and Euler's Method

6.2 Differential Equations: Growth and Decay

6.3 Separation of Variables and the Logistic Equation

6.4 First-Order Linear Differential Equations

8.2 Integration by Parts

8.5 Partial Fractions

Sample Activity: Students complete the worksheet in small groups and then compare their solutions with another group.

IA: If possible, draw the graph of a function f that satisfies the criteria. If it is not possible, state why.

1. Horizontal tangent at $(2, 4)$, two points of inflection, and $\lim_{x\to\infty} f(x) = \infty$.
2. Local minimum at $x = 3$, absolute maximum at $x = -2$ and $\lim_{x\to\infty} f(x) = 1$.
3. The derivative has three horizontal tangents.
4. f' has one point of inflection, $(0, 0)$ is a point on f', and $\lim_{x\to\infty} f(x) = -\infty$.
5. Vertical asymptotes at $+/-1$, a critical point at $x = 0$, and $\lim_{x\to+/-\infty} f(x) = 0$.
6. Concave up for $x < 2$, concave down for $x > 2$, and no critical points. **[CR2d: connections between graphical and verbal]**

[CR2d] — The course provides opportunities for students to engage with graphical, numerical, analytical, and verbal representations and demonstrate connections among them.

Unit 6: Area and Volume (9 days)

- Determine the area of regions using definite integrals resulting from vertical or horizontal slicing.
- Use definite integrals to compute volume using disks and washers.
- Use definite integrals to compute volume of solids generated by rotating a region about various vertical and horizontal lines.
- Use definite integrals to compute volume of objects having known cross-sections.
- Use definite integrals to find arc length.

Textbook Section and Section Title

7.1 Area of a Region Between Two Curves

7.2 Volume: The Disk Method

7.3 Volume: The Shell Method

7.4 Arc Length and Surfaces of Revolution

Sample Activity:

CA: 1. Let R be the region bounded by $x = y + 3$ and $x = e^y$ with points of intersection.

a) Set up, but do not integrate, an integral expression in terms of a single variable for the volume of the solid generated when R is revolved about the line $x = -2$.

b) Write an expression involving one or more integrals that gives the perimeter of R. Find the perimeter.

Unit 7: Sequences and Series (25 days) [CR1d: series]

- Evaluate limits of indeterminate form $0/0$ and ∞/∞ using L'Hospital's Rule.
- Determine whether one function grows faster than another using limits.
- Define an improper integral and determine its value, if it exists, using limits of definite integrals.
- Define a sequence using proper symbolic representation.
- Explore a variety of types of sequences. Include alternating, geometric, and arithmetic sequences.
- Use limit properties when determining convergence or divergence of a sequence.
- Explore partial sums using a graphing calculator.
- Define infinite series. State that an infinite series of numbers converges to a number if and only if the limit of its sequence of its partial sums exists and equals that number.
- Use the graphing calculator to show partial sums for a telescoping series and its convergence. Determine the value of a telescoping series. Use partial fractions to rewrite certain rational series as telescoping series. Review geometric series and determine whether they converge or diverge.
- Find the sum of a geometric series using $\sum_{n=0}^{\infty} ar^n = \frac{a}{1-r}$ for $-1 < r < 1$.
- Use the nth-term test for divergence.
- Identify when a series is a p-series and use its rules to determine convergence or divergence.
- Use the integral test to determine convergence or divergence.
- Use the direct comparison test and limit comparison test to determine convergence or divergence.
- Use the alternating series test to determine convergence or divergence.
- Recognize the harmonic series and the alternating harmonic series. Determine whether they converge or diverge.
- Use the error bound for convergent alternating series to estimate how close a partial sum is to the value of the infinite series.
- Understand that if a series converges absolutely, then it converges.
- Determine if a series converges absolutely or conditionally or diverges.
- In a series that converges absolutely, show that a series formed from regrouping terms has the same value.
- Use the ratio test to determine convergence or divergence.
- Recognize which test for convergence is most appropriate for a given series and then apply it to determine convergence or divergence.
- Taylor polynomials. **[CR1d: Taylor polynomials]**
  - ◊ Construct Taylor polynomials for a variety of functions centered at any point $x = a$.
  - ◊ Define a Maclaurin polynomial and use it to construct a Taylor polynomial centered at $x = 0$.
  - ◊ Use the Taylor polynomial centered at $x = a$ to approximate a function's value near $x = a$.

    - ◊ Use the Lagrange error bound to bound the error of a Taylor polynomial approximation to a function on a given interval.
- Recognize that the Maclaurin series for $1/(1-x)$ is a geometric series.
- Power Series **[CR1d: power series]**
    - ◊ Define a power series and create Maclaurin series for $\sin x$, $\cos x$, and e^x. Use these series for constructing Maclaurin series for other functions. Include algebraic processes, substitutions, using properties of geometric series, and differentiation or antidifferentiation to construct.
    - ◊ Determine the interval of convergence of a power series.
    - ◊ Understand if a power series has a positive radius of convergence, then the power series is a Taylor series of the function to which it converges over the open interval.
    - ◊ Recognize that the radius of convergence does not change when a power series is differentiated or integrated term by term.

[CR1d] — The course is structured around the enduring understandings within Big Idea 4: Series.

Textbook Section and Section Title

8.7 Indeterminate Forms and L'Hospital's Rule

8.8 Improper Integrals

9.1 Sequences

9.2 Series and Convergence

9.3 The Integral Test and p-Series

9.4 Comparisons of Series

9.5 Alternating Series

9.6 The Ratio and Root Tests

9.7 Taylor Polynomials and Approximations

9.8 Power Series

9.9 Representation of Functions by Power Series

9.10 Taylor and Maclaurin Series

Sample Activity: Students are given the following questions as a practice test in class and discuss their answers in small groups the next day.

IA: 1. If $\sum_{n=0}^{\infty} a_n x^n$ is a Taylor series that converges to $f(x)$ for all real x, then $f'(1) =$

a) 0

b) a_1

c) $\sum_{n=0}^{\infty} a_n$

d) $\sum_{n=1}^{\infty} na_n$

e) $\sum_{n=1}^{\infty} na_n^{n-1}$

IA: 2. What is the sum of the series $1 + ln2 + \frac{(ln2)^2}{2!} + \cdots + \frac{(ln2)^n}{n!} + \cdots$?

IA: 3. The Taylor series for $sin\,x$ about $x = 0$ is $x - \frac{x^3}{3!} + \frac{x^5}{5!} - \cdots$. If f is a function such that $f'(x) = \sin(x^2)$, then find the coefficient of x^7 in the Taylor series for $f(x)$ about $x = 0$.

IA: 4. Which of the following series diverge?

a) $\sum_{k=3}^{\infty} \frac{2}{k^2+1}$

b) $\sum_{k=1}^{\infty} (\frac{6}{7})^k$

c) $\sum_{k=2}^{\infty} \frac{(-1)^k}{k}$

IA: 5. Does $\int_1^{\infty} \frac{x}{(1+x^2)^2} dx$ converge and, if so, to what value?

IA: 6. Does $\int_{-1}^{1} \frac{3}{x^2} dx$ converge and, if so, to what value?

IA: 7. What are all values of x for which the series $\sum_{n=1}^{\infty} \frac{(x-2)^n}{n3^n}$ converges?

IA: 8. Let $f(x) = \ln(1 + x^3)$.

a) The Maclaurin series for $\ln(1 + x)$ is $x - \frac{x^2}{2} + \frac{x^3}{3} - \frac{x^4}{4} + \cdots + (-1)^{n+1}.\frac{x^n}{n} + \cdots$. Use the series to write the first four nonzero terms and the general term of the Maclaurin series for f.

b) The radius of convergence of the Maclaurin series for f is 1. Determine the interval of convergence. Show the work that leads to your answer.

c) Write the first four nonzero terms of the Maclaurin series for $f'(t^2)$. If $g(x) = \int_0^x f'(t^2)dt$, use the first two nonzero terms of the Maclaurin series for g to approximate $g(1)$.

d) The Maclaurin series for g, evaluated at $x = 1$, is a convergent alternating series with individual terms that decrease in absolute value to 0. Show that your approximation in part (c) must differ from $g(1)$ by less than $1/5$.

IA: 9. In the problems below, determine if the series converges or diverges. State the test used and explain why used.

a) $\sum_{n=1}^{\infty} \frac{\sqrt{n}}{n}$

b) $\sum_{n=1}^{\infty} 5(-\frac{1}{5})^n$

c) $\sum_{n=1}^{\infty} \frac{1}{3^n+2}$

d) $\sum_{n=1}^{\infty} \frac{1}{3n^2-2n-15}$

e) $\sum_{n=1}^{\infty} \frac{n}{2n+3}$

f) $\sum_{n=1}^{\infty} (\frac{1}{n+1} - \frac{1}{n+2})$

g) $\sum_{n=1}^{\infty} \frac{n}{(n^2+1)^2}$

h) $\sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{2n-1}$

Unit 8: Parametric and Polar Functions (15 days)

- Find derivatives of vector-valued functions and parametric functions and graph those functions.
- Use derivatives to determine velocity, speed, and acceleration for a particle moving along curves given by parametric or vector-valued functions.
- Solve problems involving polar coordinates, their graphs, and calculus work with derivatives, area, arc length, and surface area.

Textbook Section and Section Title

10.1 Conics and Calculus

10.2 Plane Curves and Parametric Equations

10.3 Parametric Equations and Calculus

10.4 Polar Coordinates and Polar Graphs

10.5 Area and Arc Length in Polar Coordinates

A.P. Exam Preparation (7-10 days)