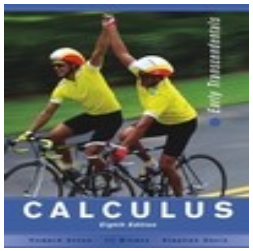

Advanced Placement AB Calculus

Performance Objectives and Time Table

Text: *Calculus,* 8th edition, by Howard Anton, Irl Bivens, Stephen Davis. John Wiley & Sons, Inc. 2005

First Nine Weeks

Unit 1A:	Graphs, Functions & Limits	10 days
Unit 1A:	Graphs, Functions & Limits	10 days
Unit 2:	Intro to Differentiation	12 days
Unit 3A:	Derivative Techniques	6 days

Total - 40 days

Second Nine Weeks

Unit 3B:	More Derivative Techniques	14 days
Unit 4:	Derivatives in Curve Sketching	14 days
Unit 5:	Applications of Derivatives	9 days

Total - 37 days

Third Nine Weeks

Unit 6:	Intro to Integrals	9 days
Unit 7:	Definite Integrals	12 days
Unit 8:	Applications of Definite Integrals	9 days

Fourth Nine Weeks

AP Exam Review

*Teacher Chosen Special Topics – list provided at the end of course objectives

Unit 9: First Order Differential Equations 7 days

Total - 37 days

Objectives	Sections Textbook Page Number(s)	Time (# days)	Comments	Calculator Reference	Tests/SOL
<u>Unit 1</u>: Graphs, Functions & Limits	**Appendix A, 2.1 – 2.3, 2.5, 2.6**	**20 days**		**√**	**APC 1, 2, 3**
1. Pre-Test: Express knowledge of algebraic and trigonometry topics	Supplement with Pre-test Worksheets	2	Two pre-tests are provided		
2. a) Determine the domain and range of a function. b) Find the zeros of a function. c) Determine if a function has x-axis, y-axis or origin symmetry. d) Determine whether a function is… even or odd, 1-1 and periodic d) Find the vertical and horizontal asymptotes of a function. f) Find the x-value of any points of discontinuity of a function.	Supplement with Worksheets	2	This is a review of the parent functions.	√	APC 1
3. Translate, stretch, compress and reflect functions	Supplement with Worksheets	2	This is review material.	√	APC 1
4. a) Review the basic properties of trig functions and their graphs. b) Solve inequalities and absolute	Appendix A p. A12 Problems listed in	2		√	APC 1

Objectives	Sections Textbook Page Number(s)	Time (# days)	Comments	Calculator Reference	Tests/SOL
value equations and inequalities.	Lesson 4 lesson plan				
5. a) Determine limits using tables and graphs. b) Determine limits by algebraic computations. c) Determine limits involving infinity	Sections 2.1 pp. 101-110 Section 2.2 pp. 113-120 Section 2.3 pp. 122-130	4		√	APC 2
6. Use the definition of continuity to determine when a function is continuous or discontinuous.	Section 2.5 pp. 144-152	2	Add in application of Intermediate Value Theorem.	√	APC 3
7. a) Determine where a trig function is discontinuous. b) Find limits with trig functions.	Section 2.6 pp. 155-159	2			APC 3
Unit 1 Review and Test		**4**			
<u>Unit 2</u>: Intro to Differentiation	**3.1 – 3.6**	**12 days**		**√**	**APC 4, 5, 6, 8, 12**
1 a) State the definition of the derivative and use it to find the derivative of a function. b) Use the concepts of slope and derivations to find average and instantaneous velocity. c) Find the equation of a tangent line to the curve y = f(x).	Sections 3.1 pp. 165-175 Section 3.2 pp. 178-186	3		√	APC 4 APC 12
2. Use properties and theorems of differentiation to find derivatives of functions that involve polynomials, products and quotients.	Section 3.3 pp. 190-195 Section 3.4 pp. 198-202	3			APC 5 APC 6 APC 8

Objectives	Sections Textbook Page Number(s)	Time (# days)	Comments	Calculator Reference	Tests/SOL
3. Differentiate absolute value and trig functions.	Section 3.5 pp. 204-207	2			APC 5
4. State and apply the Chain Rule to differentiate functions	Section 3.6 pp. 209-213	2			APC 6
Unit 2: Review and Test		**2**			

Unit 3: **More Derivative Techniques**	**1.5, 1.6, 1.8, 3.8, 4.1 – 4.3, 11.2**	**20 days**		√	**APC 1, 5, 7, 8, 9, 11, 12, 17**
1. Evaluate expressions involving increments and differentials.	Section 3.8 pp. 224-239	2			APC 12
2. a) Determine whether a function has an inverse. b) Find the inverse of a function if it exists. b) Determine whether two functions are inverses.	Section 1.5 pp. 51-61	2			APC 1 APC 12

Objectives	Sections Textbook Page Number(s)	Time (# block days)	Comments	Calculator Reference	Tests/SOL
3. a) To simplify logarithmic and exponential functions. b) Sketch the graph of logarithmic and exponential functions.	Section 1.6 pp. 65-73	2		√	APC 1

c) Solve logarithmic and exponential equations.					
4. Find derivatives implicitly.	Section 4.1 pp. 235-241	4			APC 7
5. a) Find derivatives of logarithmic and exponential functions.. b) Find derivatives of inverse functions	Section 4.2 pp. 243-247 Section 4.3 pp. 248-253	2			APC 8 APC 9
6. a) Evaluate inverse trig functions b) Find derivatives of inverse trig functions.	Section 1.5 pp. 51-61 Section 4.3 pp. 248-253	4			APC 5
UNIT 3: REVIEW AND TEST		**4**			

OBJECTIVES	SECTIONS TEXTBOOK PAGE NUMBER(S)	TIME (# BLOCK DAYS)	COMMENTS	CALCULATOR REFERENCE	TESTS/SOL
UNIT 4: **DERIVATIVES IN CURVE SKETCHING**	**5.1 – 5.4**	**14 days**		**√**	**APC 1, 12**
1. a) Use derivatives to determine where a function is increasing or decreasing. b) Use the first and second derivative tests to locate local maximum and minimum points. b) Determine where the graph of a function is concave up or down. c) Determine the inflections points of the graph of a function.	Sections 5.1 pp. 267-275 Section 5.2 pp. 279-286	4		√	APC 1 APC 12

Objectives	Sections Textbook Page Number(s)	Time (# days)	Comments	Calculator Reference	Tests/SOL
2. a) Sketch the graphs of polynomial and rational functions. b) Examine the graphs of functions that have corners and/or cusp.	Section 5.3 pp. 289-298	2		√	APC 12
3. Determine the absolute maximum and minimum values of a function.	Section 5.4 pp. 301-306	2		√	APC 12
4. Analyze the graph of a derivative.	Supplement with Worksheets	2	Old AP exam questions should be used.	√	
Unit 4 Review and Test		**4**			

Unit 5: **Applications of Derivatives**	**3.7, 5.5, 5.7, 5.8**	**9 days**		**√**	**APC 10, 12**
1. a) Solve applied maximum and minimum problems. b) State and apply Rolle's Theorem and the Mean Value Theorem for derivatives.	Section 5.5 pp. 304-318 Section 5.7 pp. 329-333	3			APC 10 APC 12
2. Solve problems involving related rates.	Sections 3.7 pp. 217-221	2			APC 12
3. Apply derivatives in solving rectilinear motion problems.	Section 5.8 pp. 336-341	1		√	APC 12
Unit 5 Review and Test		**3**			

Objectives	Sections Textbook page number(s)	Time (# days)	Comments	Calculator Reference	Tests/SOL
Unit 6:	**6.3 – 6.5**	**9 days**		**√**	**APC**

INTRO TO INTEGRALS					**14, 16**
1. Introduce the definite integral as an accumulator function.	Supplement with Worksheets	1			
2. a) Express a sum in sigma notation. b) Evaluate sums in sigma notation.	Section 6.4 pp. 373-383	1			
3. Approximate the area under a curve using left endpoint, right endpoint and midpoint approximations.	Section 6.4 pp. 373-383	1		√	APC 16
OBJECTIVES	**SECTIONS** **TEXTBOOK PAGE NUMBER(S)**	**TIME** **(# DAYS)**	**COMMENTS**	**CALCULATOR REFERENCE**	**TESTS/SOL**
4. a) Use a Riemann sum to approximate area under a curve. b) Define the definite integral.	Section 6.5 pp. 386-393	1		√	APC 16
5. a) Recognize an integral as an antiderivative and evaluate indefinite integrals. b) Use the technique of substitution to solve indefinite integrals.	Section 6.2 pp. 355-362 Section 6.3 pp. 365-371	3			APC 14
UNIT 6 REVIEW AND TEST		**2**			

UNIT 7: **DEFINITE INTEGRALS**	**6.6 – 6.9, 7.7**	**12 days**		**None**	**APC 13, 14, 15, 18**
1. a) State and apply the Fundamental Theorem of Calculus. b) State and apply the Mean Value Theorem for integrals.	Section 6.6 pp. 396-406	2			APC 14
2. a) Use integration to solve rectilinear motion. b) Find the average value of a function.	Section 7.7 pp. 481-488 Section 6.7 pp. 410-416	1			APC 15 APC 18

3. Evaluate definite integrals by substitution.	Section 6.8 pp. 419-422	2			APC 13
4. a) Investigate logarithmic functions from an integral point of view. b) Find the derivative of integrals with functions as limits of integration.	Section 6.9 pp. 425-434	1			APC 14
5. a) Evaluate integrals involving inverse trig functions. b) Evaluate integrals involving logarithms and exponents. c) Solve problems involving antidifferentiation.	Supplement with Worksheets	3			APC 15
UNIT 7 REVIEW AND TEST		**3**			

UNIT 8: **APPLICATIONS OF THE DEFINITE INTEGRALS**	**7.1, 7.2, 7.4, 7.5**	**9 days**		**√**	**APC 14, 15**
1. Determine the area between two curves.	Section 7.1 pp. 442-449	2		√	APC 14
2. a) Use disk & washer methods to find volume of a solid that results when a region is revolved about an axis or a parallel line. b) Determine the volume of a solid with a known cross section.	Section 7.2 pp. 450-456	3		√	APC 15
3. Approximate definite integrals by use of the Trapezoidal Rule	Section 8.7 pp. 556-566	1			APC 16
UNIT 8 REVIEW AND TEST		**3**			

UNIT 9: FIRST ORDER DIFFERENTIAL EQUATIONS	**9.1 – 9.3**	**7 days**		**√**	**APC 15**
1. Solve differential equations and initial value problems.	Section 9.1 pp. 582-592	1		√	APC 15
2. Model and solve application problems involving differential equations.	Section 9.3 pp. 603-607	1		√	APC 15
3. a) Sketch direction fields and use them to find solutions satisfying initial conditions. b) Use direction fields to analyze limiting values in applications. c) Construct slope fields using technology and interpret fields as visualizations of differential equations. d) Given a slope field for a differential equation, graph an approximate particular solution by hand and if possible confirm the solution algebraically.	Section 9.2 pp. 596-600	3		√	
UNIT 9 REVIEW AND TEST		**2**			

THROUGHOUT THE YEAR, EXPOSE STUDENTS TO THE TYPES OF QUESTIONS FOUND ON BOTH THE MULTIPLE CHOICE AND FREE RESPONSE SECTIONS OF THE AP TEST.

EXAMPLES OF TEACHING STRATEGIES/ STUDENT ACTIVITIES:

Written and verbal communications are stressed throughout the course. Students are required to…

1. use various types of problem-solving; this allows the students to explore solutions numerically, algebraically, graphically, and verbally. For example,
    - Students are taught to explore limits using the graphing calculator by looking at the behavior of graphs. From this graphical representation they are expected to demonstrate verbally and in writing their understanding of the connection between the graph and the table of values for that graph with respect to limits at various points. Students then calculate limits at various points analytically.
    - Students experiment with area under the curve by first using Riemann sums to estimate the area, followed by usage of a graphing calculator program where they interpret results to draw the conclusion that as n increases the Riemann sum more closely approximates the actual area under the curve. Students then integrate with and without the graphing calculator to find the exact value of the area under the curve.
2. verbally present and support their solutions to homework and released AP problems to the class.
3. show mastery of the following graphing calculator techniques:
    - graph a function in an arbitrary viewing window,
    - find the zeros of functions,
    - numerically calculate the derivative of a function, and
    - evaluate a definite integral.
4. have a TI-83+ or TI-84 graphing calculator to be brought to class daily. The graphing calculator is used to help explore and investigate calculus concepts individually and in small group settings. Examples of programs available to each student are:
    - Riemann sums
    - Euler's Method
    - Trapezoid Rule
    - Slope fields
5. complete a written end of unit activity summarizing key concepts.

6. graph (with and without a calculator) and analyze the first and second derivatives to determine the behavior of the original function. Following classroom discussion on relative extrema, inflection points, etc. students break into groups to further explore these concepts.
7. provide justification and support of answers to free response questions in complete sentences in various class assessments.

After the AP exam, the teacher should pick appropriate units of study that will benefit the calculus student as he/she pursues mathematics. The choice of units is left up to the teacher, but it is recommended that they choose from this list of topics:

1. analytic geometry/ conic sections
2. second order differential equations
3. partial differentiation
4. further applications of the integral (work, pressure, force, etc.)
5. hyperbolic functions
6. integration using tables