

AP Calculus B

Course Description

Calculus B is a mathematics course designed to provide the student with the prerequisite skills necessary for Calculus C and the advanced placement exam. A strong background in Precalculus AB and Calculus A is necessary in order to be successful in this course. The major topics explored in this course include integration and differentiation techniques for more advanced and transcendental functions. Areas and volumes are also an emphasis throughout this course. Additionally, this course addresses three learning styles (visual, auditory, and kinesthetic) through projects, discussions, online interactivities, as well as traditional coursework.

Course Materials

The following is required of all Calculus B students:

- Textbook: CALCULUS 7th edition by Larson, Hostetler, and Edwards
- Online resource: TDLC online resource (go to www.tdlc.com for subscription orders) for above text (optional)
- Barron's AP Calculus Advanced Placement Examination: Review of Calculus AB and Calculus BC 6th edition, by Hockett
- Graphing Calculator: A TI-83 Plus or TI-84. Check with your instructor for other options.
- Other Items: Access to a computer with Internet access, regular and graph paper, pencils and a notebook for hardcopy organization.

Learning Outcomes

At the completion of Calculus B, the student will be able to:

1. Understand antiderivatives and the indefinite integral
2. Find the area under a curve and understand the definition of a Riemann Sum
3. Understand the Fundamental Theorem of Calculus
4. Integrate by substitution
5. Perform numerical integration
6. Differentiate and integrate natural logarithmic functions
7. Work with inverse functions
8. differentiate and integrate exponential functions
9. Apply differential equations to growth and decay problems
10. Differentiate and integrate inverse trigonometric functions
11. work with hyperbolic functions
12. determine the area of the region between two curves

13. compute volume using the Disk and Shell method
14. Determine arc length and surfaces of revolution

Calculus B Course Outline:

The following is an overview of Calculus B course content. Students are encouraged to print this document for reference and pacing throughout the course.

Unit One :

LEARNING OUTCOMES (Unit One)

At the end of Unit one, students will be able to:

- Find the general and particular solution to a differential equation
- Find antiderivatives
- Use sigma notation to write a sum
- Approximate area and determine area using limits
- Understand the definition of Riemann sum
- Evaluate definite integrals using limits and properties

REQUIRED READING (Unit One)

The following is required reading for the first Unit.

Section	Title	Page
4.1	Antiderivatives and Indefinite Integration	242
4.2	Area	253
4.3	Riemann Sums and Definite Integrals	265

TOPIC LECTURES (Unit One)

In addition to the required reading, topic lectures are provided to support different learning styles through guided examples, simulation, animation and editable graphs. These can be accessed by students with a subscription at the following address:
www.tdlc.com

For Unit one, students will access the guided examples, simulations, animations and edible graphs for the sections covered in the required reading. Students are then asked to try each section quiz (will not be graded) to check for understanding.

ASSIGNMENTS (Unit One)

- Exercises from the book (see “Unit one exercises” for a detailed list)

CHATS (Unit One)

Students are required to attend one chat per Unit (5 points each). Bring any questions or comments.

DISCUSSION BOARD (Unit One)

Answer two of the following:

1. Introduce yourself. Why are you taking an online course?
2. Why are the basic Integration Rules on page 244 of the text fairly easy to derive?
3. Is the following statement ALWAYS TRUE, SOMETIMES TRUE or NEVER TRUE?: If a polynomial has degree n , then its antiderivative has degree $n - 1$. Explain your answer.
4. Is the following statement ALWAYS TRUE, SOMETIMES TRUE or NEVER TRUE?: If the graph of polynomial $p(x)$ has two x -intercepts, then the graph of its antiderivative has three x -intercepts.
5. In your own words, give a definition for the area of a region in the plane.

TEST (Unit One)

Learning Outcomes Assessment

STANDARDS ADDRESSED (Unit One)

Referring to the syllabus, the following NCTM Standards are addressed during Unit one: 1, 2, 3, 4, 8, 9. The following California State Board of Education Standards are addressed during Unit one: 13.0, 16.0

Unit Two :

LEARNING OUTCOMES (Unit Two)

At the end of Unit two, students will be able to:

- Evaluate definite Integrals using the Fundamental Theorem of Calculus
- Apply the Mean Value Theorem for Integrals
- Determine average values over a closed interval
- Apply the Second Fundamental Theorem of Calculus
- Understand patterns and change of variables as applied to indefinite integrals
- Apply the General Power Rule for Integration
- Find a definite integral involving even or odd functions
- Apply the Trapezoidal Rule and Simpson's Rule
- Approximate error in applying these rules

REQUIRED READING (Unit Two)

The following is required reading for the second Unit.

Section	Title	Page
4.4	The Fundamental Theorem of Calculus	275
4.5	Integration By Substitution	288
4.6	Numerical Integration	303

TOPIC LECTURES (Unit Two)

In addition to the required reading, topic lectures are provided to support different learning styles through guided examples, simulation, animation and editable graphs.

These can be accessed by students with a subscription at the following address:

www.tdlc.com

For Unit two, students will access the guided examples, simulations, animations and edible graphs for the sections covered in the required reading. Students are then asked to try each section quiz (will not be graded) to check for understanding.

ASSIGNMENTS (Unit Two)

- Exercises from the textbook (see “Unit Two Assignments”)
- Consider project options; decide on which project you would like to begin.

CHATS (Unit Two)

Students are required to attend one chat per Unit (5 points each). Bring any questions or comments.

DISCUSSION BOARD (Unit Two)

Answer two of the following:

1. Show that the Fundamental Theorem of Calculus holds for the function $f(x) = 2x$.
2. In your own words, explain the difference between an *even* and an *odd* function.
3. Which tends to be more challenging: differentiation or integration Discuss your answer.
4. Make up your own integration problem that must be solved by a change of variables. Then, solve the problem and show your work.
5. What basic technique does *pattern recognition* and *change of variables* use?

TEST (Unit Two)

Unit Two Test

STANDARDS ADDRESSED (Unit Two)

Referring to the syllabus, the following NCTM Standards are addressed during Unit two: 1, 2, 6, 8. The following California State Board of Education Standards are addressed during Unit two: 15.0, 17.0.

Unit Three :

LEARNING OUTCOMES (Unit Three)

At the end of unit three, students will be able to:

- Understand the number e and apply the properties of logarithms
- Find derivatives of functions involving the natural logarithmic function
- Apply the Log Rule for Integration
- Integrate a rational function and trigonometric functions
- Find the derivative of an inverse function

REQUIRED READING (Unit Three)

The following is required reading for the third Unit.

Section	Title	Page
5.1	The Natural Logarithmic Function: Differentiation	314
5.2	The Natural Logarithmic Function: Integration	324
5.3	Inverse Functions	332

TOPIC LECTURES (Unit Three)

In addition to the required reading, topic lectures are provided to support different learning styles through guided examples, simulation, animation and editable graphs. These can be accessed by students with a subscription at the following address:
www.tdlc.com

For Unit three, students will access the guided examples, simulations, animations and edible graphs for the sections covered in the required reading. Students are then asked to try each section quiz (will not be graded) to check for understanding.

ASSIGNMENTS (Unit Three)

- Exercises from the textbook (see “Unit Two Assignments”)
- Work on projects

CHATS (Unit Three)

Students are required to attend one chat per Unit (5 points each). Bring any questions or comments.

DISCUSSION BOARD (Unit Three)

Answer two of the following:

1. Find a particular solution to the differential equation $f'(x) = 3x$ whose graph passes through the point (1, -2).
2. Make up your own integration problem that uses the General Power Rule for Integration. Solve, and show your work.
3. Give three areas where the number e is used.
4. Solve the logarithmic equation $\ln(2x - 1) = 1$. Round your answer to three decimal places.
5. What is a simple way to check your answer to an integration problem if the answer is not available?

TEST (Unit Three)

Unit Three Test

STANDARDS ADDRESSED (Unit Three)

Referring to the syllabus, the following NCTM Standards are addressed during Unit three: 1, 2, 6, 8, 9. The following California State Board of Education Standards are addressed during Unit three: 17.0

Unit Four :

LEARNING OUTCOMES (Unit Four)

At the end of unit four, students will be able to:

- Apply the properties for the natural exponential function
- Differentiate and integrate natural exponential and logarithmic functions
- Differentiate and integrate exponential functions (other than base e)
- Model compound interest and exponential growth
- Solve differential equations by separation of variables
- Model exponential growth and decay situations and other related problems

REQUIRED READING (Unit Four)

The following is required reading for the fourth Unit.

Section	Title	Pages
5.4	Exponential Functions: Differentiation and Integration	341

5.5	Bases Other than e and Applications	351	TOPIC LECTURES (Unit Four)
5.6	Differential Equations: Growth and Decay	361	

In addition to the required reading, topic lectures are provided to support different learning styles through guided examples, simulation, animation and editable graphs. These can be accessed by students with a subscription at the following address:
www.tdlc.com

TOPIC LECTURES (Unit Four)

For Unit four, students will access the guided examples, simulations, animations and edible graphs for the sections covered in the required reading. Students are then asked to try each section quiz (will not be graded) to check for understanding.

ASSIGNMENTS (Unit Four)

- Exercises from the textbook (see “Unit four Assignments”)
- Work on projects

CHATS (Unit Four)

Students are required to attend one chat per Unit (5 points each). Bring any questions or comments.

DISCUSSION BOARD (Unit Four)

Answer two of the following:

1. List three points (x,y) that lie on the graph on the inverse if the function: $f(x) = \ln(x)$
2. Substance X has a half life of 23 years. If 400 grams of substance X is now present, how much will be present in 46 years?
3. Find the area of the region bounded by $y = -1$, $x = 3$, and $y = \log x$ (base 10).
4. In your own words, describe Newton 's Law of Cooling.
5. Suppose y is directly proportional to x, and $x = 1000$ when $y = 2400$. Find x when $y = 4400$.

TEST (Unit Four)

Unit Four Test

STANDARDS ADDRESSED (Unit four)

Referring to the syllabus, the following NCTM Standards are addressed during Unit four: 1, 2, 3, 4, 5, 6, 8, 9. The following California State Board of Education Standards are addressed during Unit four: 17.0

Unit Five :

LEARNING OUTCOMES (Unit Five)

At the end of unit five, students will be able to:

- Use initial conditions and separation of variables to find solutions to differential equations
- Solve homogeneous differential equations
- Know and apply properties for the six inverse trigonometric functions
- Differentiate inverse trigonometric functions
- Perform integration with functions that involve inverse trigonometric functions

REQUIRED READING (Unit Five)

The following is required reading for the fifth Unit.

Section	Title	Pages
5.7	Differential Equations: Separation of Variables	369
5.8	Inverse Trigonometric Functions: Differentiation	380
5.9	Inverse Trigonometric Functions: Integration	388

TOPIC LECTURES (Unit Five)

In addition to the required reading, topic lectures are provided to support different learning styles through guided examples, simulation, animation and editable graphs. These can be accessed by students with a subscription at the following address:

www.tdlc.com

For Unit five, students will access the guided examples, simulations, animations and edible graphs for the sections covered in the required reading. Students are then asked to try each section quiz (will not be graded) to check for understanding.

ASSIGNMENTS (Unit Five)

- Exercises from the textbook (see “Unit Five Assignments”)
- Work on projects

CHATS (Unit Five)

Students are required to attend one chat per Unit (5 points each). Bring any questions or comments.

DISCUSSION BOARD (Unit Five)

Answer two of the following:

1. How is calculus B going? What are my strengths and weaknesses in this class? How much time do I spend each day studying for this class, on average? What suggestions would I make to improve this class?
2. Briefly discuss the difference between a general and a particular solution to a differential equation.
3. How many initial conditions are required when finding the particular solution to a differential equation?
4. Describe in your own words how two families can be mutually orthogonal.
5. Explain why the following statement is false: $\arctan(0) = -\pi$

TEST (Unit Five)

Unit Five Test

STANDARDS ADDRESSED (Unit Five)

Referring to the syllabus, the following NCTM Standards are addressed during Unit five: 1, 2, 4, 6, 8. The following California State Board of Education Standards are addressed during Unit five: 17.0, 18.0, 19.0

Unit Six:

LEARNING OUTCOMES (Unit Six)

At the end of unit six, students will be able to:

- Understand basic properties of hyperbolic functions
- Differentiate and integrate hyperbolic functions
- Differentiate and integrate inverse hyperbolic functions
- Find the area of the region between two curves using integration
- Find the volume of a solid using the disk and washer methods
- Determine volumes with specified cross sections

REQUIRED READING (Unit Six)

The following is required reading for the sixth Unit.

Section	Title	Pages
5.10	Hyperbolic Functions	395

6.1	Area of a Region Between Two Curves	412
6.2	Volume: The Disk Method	421

TOPIC LECTURES (Unit Six)

In addition to the required reading, topic lectures are provided to support different learning styles through guided examples, simulation, animation and editable graphs. These can be accessed by students with a subscription at the following address: www.tdlc.com

For Unit six, students will access the guided examples, simulations, animations and edible graphs for the sections covered in the required reading. Students are then asked to try each section quiz (will not be graded) to check for understanding.

ASSIGNMENTS (Unit Six)

- Unit Six Assignments
- Work on projects

CHATS (Unit Six)

Students are required to attend one chat per Unit (5 points each). Bring any questions or comments.

DISCUSSION BOARD (Unit Six)

Answer two of the following:

- Are derivatives and integrals for hyperbolic functions easy to remember? Why or why not?
- What is the variable of integration when horizontal representative rectangles are used in finding the area between two curves?
- Give the integration formula for finding the volume of a solid using the disk method.
- Give the integration formula for finding the volume of a solid using the washer method.
- If two curves intersect at more than two points, then what does finding the area of the region between these two curves require?

TEST (Unit Six)

Unit Six Test

STANDARDS ADDRESSED (Unit Six)

Referring to the syllabus, the following NCTM Standards are addressed during Unit six: 1, 2, 3, 4, 6, 8, 9. The following California State Board of Education Standards are addressed during Unit six: 16.0, 20.0

Unit Seven :

LEARNING OUTCOMES (Unit Seven)

At the end of unit seven, students will be able to:

- Determine volume using the shell method
- Discriminate between the shell and disk methods
- Find the arc length of a curve
- Determine area for a surface revolution

REQUIRED READING (Unit Seven)

The following is required reading for the seventh Unit.

Section	Title	Pages
6.3	Volume: The Shell Method	432
6.4	Arc Length and Surfaces of Revolution	440

TOPIC LECTURES (Unit Seven)

In addition to the required reading, topic lectures are provided to support different learning styles through guided examples, simulation, animation and editable graphs. These can be accessed by students with a subscription at the following address:
www.tdlc.com

For Unit seven, students will access the guided examples, simulations, animations and edible graphs for the sections covered in the required reading. Students are then asked to try each section quiz (will not be graded) to check for understanding.

ASSIGNMENTS (Unit Seven)

- Unit seven assignments
- Work on projects

CHATS (Unit Seven)

Students are required to attend one chat per Unit (5 points each). Bring any questions or comments.

DISCUSSION BOARD (Unit Seven)

Answer two of the following:

1. Give the integration formula for finding the volume of a solid (shell method).
2. Explain how the formula for the volume of a sphere can be derived using integration techniques.
3. In your own words, what is a **rectifiable** curve. Give an example.
4. Give two real life situations of a **catenary** .
5. Use your graphing calculator to find the are length of the curve $y = 2x - 5$ on the interval $[-2, 4]$. What other method could be used?

TEST (Unit Seven)

Unit Seven Test

STANDARDS ADDRESSED (Unit Seven)

Referring to the syllabus, the following NCTM Standards are addressed during Unit seven: 1, 2, 3, 4, 5, 6, 7, 8, 9 . The following California State Board of Education Standards are addressed during Unit seven: 16.0, 19.0, 20.0

Unit Eight :

LEARNING OUTCOMES (Unit Eight)

At the end of unit eight, students will be able to:

- Make connections between projects and learning outcomes for this course.
- Demonstrate knowledge of trigonometry sufficient for placement in higher mathematics.

REQUIRED READING (Unit Eight)

Students are asked to review prior readings in preparation for the final exam.

TOPIC LECTURES (Unit Eight) In addition to the required reading, topic lectures are provided to support different learning styles through guided examples, simulation, animation and editable graphs. These can be accessed by students with a subscription at the following address: www.tdlc.com

For Unit eight, students will access the guided examples, simulations, animations and edible graphs for the sections covered in the required reading. Students are then asked to try each section quiz (will not be graded) to check for understanding.

ASSIGNMENTS (Unit Eight)

- Review exercises

- Complete and turn in projects to the instructor.

CHATS (Unit Eight)

Students are required to attend one chat per Unit (5 points each). Bring any questions or comments.

TEST (Unit Eight)

Final Exam

DISCUSSION BOARD (Unit Eight)

Answer two of the following:

- What areas do I need to focus on the most in order to prepare for the final exam?
- Have I completed and turned in my projects?
- What formulas do I need to be familiar with before I take the final exam?
- What math class am I taking next?
- What did I get out of this course? How did taking this course help me the most?

STANDARDS ADDRESSED (Unit Eight)

Referring to the syllabus, the following NCTM Standards are addressed during Unit eight: 1, 2, 3, 4, 6, 7, 8, 9, 10. The following California State Board of Education Standards are addressed during Unit seven: 13.0 to 21.0

To Parents

Parents are encouraged to monitor student progress wherever appropriate and to be proactive in their child's learning. Parents can obtain a copy of the course outline on the course website. Parents will be contacted throughout the course to update student progress. Parents are also encouraged to communicate with the instructor should any questions or concerns arise.

To Be Successful in this Class

Being proactive about your progress and learning in this course is your key to success! You are the one who needs to be in charge of your learning. Successful students will do all the following:

- Do the required reading.
- Carefully read and retry the examples/exercises from the text.
- Visit all teacher recommended websites and do all of the activities suggested in the topic lectures for each unit.

- Ask questions wherever possible. Be assertive about your learning!
- Be involved with online chats and discussions.
- Submit all assignments, projects, and tests on time.
- Pace yourself! Budget and plan your time carefully.
- Start your projects when suggested.

Assessment

Both formal and informal assessments methods will be employed. Informal assessment will include an evaluation of participation in chats and discussions and grading rubrics for projects and assignments. Formal assessment will be employed for tests and the final examinations.

Total point values for all categories are as follows:

Assignments	160 points	Assignments are worth 20 points and should be submitted to the instructor.
Tests	300 points	There will be a total of 6 tests (Units 2 to 7 only), 50 points each. Tests should be taken after assignments for the units that have been completed.
Chats	40 points	There will be a total of 8 chats, 5 points each.
Discussions	80 points	There will be a total of 8 discussions, 10 points each. Answers to be posted on DISCUSSION BOARD
Projects	200 points	There will be two projects, 100 points each. Submit projects electronically.
Final Exam	100 points	The final exam should be taken at the end of the 8th unit.

Grade Scale

This course is worth a total of 880 points. Your final grade will be determined according to the following:

Points	Percentage Earned
A	90% - 100%
B	80% - 89%
C	70% - 79%
D	60% - 69%
F	59% and lower

Time Management

You should expect to spend 12-15 hours per unit on the assignments, discussions, chats, tests, and projects. This course will cover chapters 1 – 3 from the text CALCULUS 7th edition, Larson, Hostetler, Edwards

Using the Equation Editor

Equation Editor, available on Microsoft Word, allows students and teachers to write mathematical expressions and equations directly onto a Word document. This option is especially useful with online math courses because it is easy to use with Blackboard and email. The following instructions will help to make Equation Editor accessible on your toolbar.

Begin by opening a blank Word document. Go to **View**, then to **Toolbars**, then to **Customize**. Under “categories”, click on **Insert**. Under “commands”, find **Equation Editor**. Drag **Equation Editor** up to your toolbar (anywhere on the toolbar will be fine). The button on your toolbar will look like a square root symbol.

You should now practice using **Equation Editor** on a blank Word document until you can use it comfortably.

Standards Addressed

Both National Council of Teachers of Mathematics (NCTM) and California State Board of Education Mathematics Content Standards are addressed throughout this course.

A summary of NCTM standards are listed as follows. Detailed learning expectations for each of the following can be viewed on the NCTM website.

- Number and Operations
- Algebra
- Geometry
- Measurement
- Data Analysis and Probability
- Problem Solving
- Reasoning and Proof
- Communication
- Representation

California State Board of Education Standards for Mathematics can be viewed at:

<http://www.cde.ca.gov/be/st/ss/mthtrig.asp>

ESLR's

NUVHS Expected Schoolwide Learning Results (ESLRs):

It is anticipated that NUVHS students will be:

Engaged Learners

1. Demonstrate self-directed learning skills such as time management, and personal responsibility through the completion of course requirements
2. Develop an understanding of their own preferred learning styles to enhance their overall academic potential
3. Incorporate effective and relevant internet and multimedia resources in their learning process to broaden their knowledge base

Critical Thinkers

1. Effectively analyze and articulate sound opinions on a variety of complex concepts
2. Illustrate a variety of problem-solving strategies that strengthen college preparation and workforce readiness
3. Formulate a framework for applying a variety of technology and internet-based research to enhance information literacy and collaborative thinking

Effective Communicators

1. Demonstrate awareness and sensitivity to tone and voice in multiple forms of communication
2. Express concepts and ideas in a variety of forms
3. Enhance communication skills through the use of media rich or other technology resources

Global Citizens

1. Appreciate the value of diversity
2. Understand the range of local and international issues facing today's global community
3. Demonstrate awareness of the importance of cultural sensitivity and social responsibility in the 21st century