

Course Syllab	us
Introduction	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:
	<ul> <li>Textbook: <u>CALCULUS</u> 7th edition by Larson, Hostetler, and Edwards</li> <li>Barron's AP Calculus Advanced Placement Examination: Review of Calculus AB and Calculus BC 6 th edition, by Hockett</li> </ul>
	Graphing Calculator: A TI-83 Plus or TI-84. Check with your instructor for other     ontions
	<ul> <li>Other Items: Access to a computer with Internet access, regular and graph paper, pencils and a notebook for hardcopy organization.</li> </ul>
Major Learning Targets	Concepts and Procedures: Students can explain and apply mathematical concepts and carry out mathematical procedures with precision and fluency
- U	Problem Solving: Students can frame and solve a range of complex problems in pure and applied mathematics
	Communication and Reasoning: Students can clearly and precisely construct viable arguments to support their own reasoning and critique the reasoning of others
	Data Analysis and Modeling: Students can analyze complex, real-world scenarios and can use mathematical models to interpret and solve problems.
Learning Outcomes	At the completion of Calculus B, the student will be able to:
	<ol> <li>Understand antiderivatives and the indefinite integral</li> <li>Find the area under a curve and understand the definition of a Riemann Sum</li> <li>Understand the Fundamental Theorem of Calculus</li> <li>Integrate by substitution</li> <li>Perform numerical integration</li> </ol>
	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

# Course Calculus B Course Outline:

## 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)** 



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)

## LIVE LEARNING AND CHAT SESSIONS (Unit One)

Students are required to attend one live session 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 <u>NCTM</u> 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, 14.0, 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)**

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.

#### LIVE LEARNING AND CHAT SESSIONS (Unit Two)

Students are required to attend one live session 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)**



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

## LIVE LEARNING AND CHAT SESSIONS (Unit Three)

Students are required to attend one live session 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 <u>NCTM</u> 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, 20.0

#### 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	Section Title					
5.4	Exponential Functions: Differentiation and Integration	341				
5.5	Bases Other than e and Applications	351				
5.6	Differential Equations: Growth and Decay	361				

# **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

#### LIVE LEARNING AND CHAT SESSIONS (Unit Four)

Students are required to attend one live session per unit (5 points each). Bring any questions or comments.

#### **DISCUSSION BOARD (Unit Four)**

Answer two of the following:



- List three points (x,y) that lie on the graph on the inverse if the function: f(x) = In(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** = **logx** (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 <u>NC</u>TM 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:	388
	Integration	

## **TOPIC LECTURES (Unit Five)**

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

## LIVE LEARNING AND CHAT SESSIONS (Unit Five)

Students are required to attend one live session 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) = -p**

#### TEST (Unit Five)

Unit Five Test

# STANDARDS ADDRESSED (Unit Five)

Referring to the syllabus, the following <u>N</u>CTM 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



#### **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	412
	Curves	
6.2	Volume: The Disk Method	421

#### **TOPIC LECTURES (Unit Six)**

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

#### LIVE LEARNING AND CHAT SESSIONS (Unit Six)

Students are required to attend one live session 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 <u>NCT</u>M 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

#### 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)**

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

## LIVE LEARNING AND CHAT SESSIONS (Unit Seven)

Students are required to attend one live session 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 <u>NCTM</u> 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, 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)**

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.

# LIVE LEARNING AND CHAT SESSIONS (Unit Eight)

Students are required to attend one live session 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 <u>NCTM</u> 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

10

10

10

## **Grading Rubric**

Use the following rubric to grade projects.

Student f	ollowed	all instru	ctions, a	nd all cor	nponent	s are pre	sent.	
1	2	3	4	5	6	7	8	9
Student a	answers	are easy	to follow	•				
1	2	3	4	5	6	7	8	9

All calculations are concise and accurate. 1 2 3 4 5 6 Student work is organized

Student work is organized.

1	2	3	4	5	6	7	8	9	10
1	2	3	4	5	6	7	8	9	10
Proiect re	eflects a	good eff	ort on the	e part of	the stude	ent.			
1	2	3	4	5	6	7	8	9	10
		-							

7

8

9

**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.

What Does It<br/>Take To Be<br/>Successful InBeing proactive about your progress and learning in this course is your key to success!<br/>You are the one who needs to be in charge of your learning. Successful students will do<br/>all the following:

This Course?

- 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.



	<ul> <li>Submit all assig</li> <li>Pace yourself!</li> <li>Start your proj</li> </ul>	gnments, project Budget and plan ects when sugge	s, and tests on time. your time carefully. sted.	
Assessment	Both formal and inform will include an evaluati projects and assignmen examinations.	nal assessments on of participation nts. Formal asses	methods will be employe on in chats and discussio sment will be employed	ed. Informal assessment ns and grading rubrics for for tests and the final
Submitting Homework	Students will be require can be submitted elect program available thro	ed to submit hor ronically using a ugh Blackboard.	nework to the instructor scanner, a FAX machine,	r each unit. Homework , or the equation editing
Scale			ording to the following.	
		Letter Grade	Percentage Earned	1
		А	95%+	
		A-	90% - 94.9%	
		B+	87% - 89.9%	
		В	84% - 86.9%	
		В-	80% - 83.9%	
		C+	77% - 79.9%	
		С	74% - 76.9%	
		C-	70% - 73.9%	
		D+	67% - 69.9%	
		D	64% - 66.9%	
		D -	60% - 63.9%	
		F	59% and lower	

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

Using Equation Editor, available on Microsoft Word, allows students and teachers to write Equation mathematical expressions and equations directly onto a Word document. This option is Editor 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.

StandardsBoth National Council of Teachers of Mathematics (NCTM) and California State Board ofAddressedEducation 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

NUVHS	NUVHS Expected Schoolwide Learning Results (ESLRs):
Expected	
Schoolwide	It is anticipated that NUVHS students will be:
Learning	
Results	Engaged Learners
(ESLRs)	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 communiccation 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