

# HONORS CALCULUS

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**TEXTBOOK:** Calculus: An Applied Approach, 7<sup>th</sup> Ed. © 2006  
**HOMEWORK HOTLINE:** (610) 868-1431, x1444

**AUTHORS:** Larson / Edwards  
**PUBLISHER:** Houghton Mifflin Co.  
**VOICEMAIL:** (610) 868-1431, x166

## COURSE DESCRIPTION:

This course introduces the student to single-variable calculus and its application to the worlds of mathematics, science and engineering. Topics include: limits and continuity, derivatives, applications of derivatives, integration, applications of integrals, transcendental functions, differential equations, L'Hopital's Rule, and improper integrals.

**PREREQUISITES:** Precalculus or Honors Algebra 2 and Honors Trigonometry  
At least 70% on the placement test

**COURSE OBJECTIVES:** Upon completion of the course, the student should be able to:

### Chapter 0 - A Precalculus Review

1. Represent, classify, and order real numbers
2. Use inequalities to represent sets of real numbers
3. Solve inequalities
4. Use inequalities to model and solve real-life problems
5. Find the absolute value of real numbers and understand the properties of absolute values
6. Find the distance between two numbers on the real number line
7. Define intervals on the real number line
8. Find the midpoint of an interval and use intervals to model and solve real-life problems
9. Evaluate expressions involving exponents or radicals
10. Simplify expressions with exponents
11. Find the domains of algebraic and radical expressions
12. Use special products and factorization techniques to factor polynomials
13. Use symbolic division to factor polynomials of degree three or more
14. Use the Rational Zero Theorem to find the real zeros of polynomials
15. Add and subtract rational expressions
16. Simplify rational expressions involving radicals
17. Rationalize numerators and denominators of rational expressions

### Chapter 1 - Functions, Graphs, and Limits

1. Plot points in a coordinate plane and read data presented graphically
2. Find the distance between two points in a coordinate plane
3. Find the midpoints of line segments connecting two points
4. Translate points in a coordinate plane
5. Sketch graphs of equations by hand
6. Find the x- and y-intercepts of graphs of equations
7. Write the standard forms of equations of circles
8. Find the points of intersection of two graphs
9. Use mathematical models to model and solve real-life problems
10. Use the slope-intercept form of a linear equation to sketch graphs
11. Find slopes of lines passing through two points
12. Use the point-slope form to write equations of lines
13. Find equations of parallel and perpendicular lines
14. Use linear equations to model and solve real-life problems
15. Decide whether relations between two variables are functions
16. Find the domains and ranges of functions
17. Use function notation and evaluate functions
18. Combine functions to create other functions
19. Find inverse functions algebraically
20. Find limits of functions graphically and numerically
21. Use the properties of limits to evaluate limits of functions
22. Use different analytic techniques to evaluate limits of functions
23. Evaluate one-sided limits
24. Recognize unbounded behavior of functions

25. Determine the continuity of functions
26. Determine the continuity of functions on a closed interval
27. Use the greatest integer function to model and solve real-life problems
28. Use compound interest models to solve real-life problems

#### Chapter 2 - Differentiation

1. Identify tangent lines to a graph at a point
2. Approximate the slopes of tangent lines to graphs at points
3. Use the limit definition to find the slopes of graphs at points
4. Use the limit definition to find the derivatives of functions
5. Describe the relationship between differentiability and continuity
6. Find the derivative of functions using the Constant, Power, Constant Multiple, and Sum and Difference Rules
7. Use derivatives to answer questions about real-life situations
8. Find the average rates of change of functions over intervals
9. Find the instantaneous rates of change of functions at points
10. Find the marginal revenues, marginal costs, and marginal profits for products
11. Find the derivatives of functions using the Product and Quotient rules
12. Simplify derivatives
13. Find derivatives using the Chain Rule
14. Find derivative using the General Power Rule
15. Write derivatives in simplified form
16. Use the differentiation rules to differentiate algebraic functions
17. Find higher-order derivatives
18. Find and use the position functions to determine the velocity and acceleration of moving objects
19. Find derivatives both explicitly and implicitly
20. Examine related variables
21. Solve related-rate problems

#### Chapter 3 - Applications of the Derivative

1. Test for increasing and decreasing functions
2. Find the critical numbers of functions and find the open intervals on which functions are increasing or decreasing
3. Use increasing and decreasing functions to model and solve real-life problems
4. Recognize the occurrence of relative extrema of functions
5. Use the First Derivative Test to find the relative extrema of functions
6. Find absolute extrema of continuous functions on a closed interval
7. Find minimum and maximum values of real-life models and interpret the results in context
8. Determine the intervals on which the graphs of functions are concave up or concave down
9. Find the points of inflection of the graphs of functions
10. Use the Second Derivative Test to find the relative extrema of functions
11. Find the points of diminishing returns of input-output models
12. Solve real-life optimization problems
13. Find the price elasticity of demand for demand functions
14. Recognize basic business terms and formulas
15. Find the vertical asymptotes of functions and find infinite limits
16. Find the horizontal asymptotes of functions and find limits at infinity
17. Use asymptotes to answer questions about real-life situations
18. Recognize and analyze the graphs of functions
19. Find the differentials of functions
20. Use differentials to approximate changes in functions

#### Chapter 4 - Exponential Functions

1. Use the properties of exponents to evaluate and simplify exponential expressions
2. Sketch the graphs of exponential and natural log functions
3. Evaluate and graph functions involving the natural exponential function
4. Solve compound interest and present value problems
5. Find the derivatives of natural exponential functions
6. Use calculus to analyze the graphs of functions that involve the natural exponential function
7. Use properties of logarithms to simplify, expand, and condense logarithmic expressions
8. Use inverse properties of exponential and logarithmic functions to solve exponential and logarithmic equations
9. Use properties of natural logarithms to answer questions about real-life situations
10. Find the derivatives of natural logarithmic functions

11. Use the change-of-base formula to evaluate logarithmic expressions involving other bases
12. Find derivatives of exponential and logarithmic functions involving other bases

#### Chapter 5 - Integration and Its Applications

1. Understand the definition of antiderivative
2. Use indefinite integral notation for antiderivative
3. Use basic integration rules to find antiderivatives
4. Use initial conditions to find particular solutions to indefinite integrals
5. Use antiderivatives to solve real-life problems
6. Use the General Power Rule to find indefinite integrals
7. Use substitution to find indefinite integrals
8. Use the Exponential and Log Rules to find indefinite integrals
9. Evaluate definite integrals
10. Evaluate definite integrals using the Fundamental Theorem of Calculus
11. Use definite integrals to solve marginal analysis problems
12. Find the average value of functions over closed intervals
13. Find the areas of regions bounded by two graphs
14. Use the areas of regions bounded by two graphs to solve real-life problems
15. Use the Midpoint Rule to approximate definite integrals
16. Use a symbolic integration utility to approximate definite integrals
17. Use the Disk and Washer Methods to find volumes of solids of rotation

#### Chapter 6 - Techniques of Integration

1. Use the basic integration formulas to find indefinite integrals
2. Use substitution to find indefinite integrals
3. Use substitution to evaluate definite integrals
4. Use integration to solve real-life problems
5. Use integration by parts to find indefinite and definite integrals
6. Use the Trapezoidal Rule and Simpson's Rule to approximate definite integrals

#### Chapter 8 - Trigonometric Functions

1. Sketch graphs of trigonometric functions
2. Evaluate limits of trigonometric functions
3. Find derivatives of trigonometric functions
4. Find the relative extrema of trigonometric functions
5. Use derivative of trigonometric functions to answer questions about real-life situations
6. Find the six basic trigonometric integrals
7. Solve trigonometric integrals
8. Approximate limits that produce indeterminate forms
9. Use L'Hôpital's Rule to evaluate limits

### **COURSE OUTLINE:**

#### FIRST QUARTER

Chapter 0 – A Precalculus Review

Sections 0.1 – 0.5

Chapter 1 – Functions, Graphs, and Limits

Sections 1.1 – 1.6

Chapter 2 - Differentiation

Sections 2.1 - 2.5

#### SECOND QUARTER

Chapter 2 - Differentiation

Sections 2.6 - 2.8

Chapter 3 – Applications of the Derivative

Sections 3.1 – 3.8

#### THIRD QUARTER

Chapter 4 - Exponential & Logarithmic Functions

Sections 4.1 - 4.6

Chapter 5 - Integration and Its Applications

Sections 5.1 - 5.7

#### FOURTH QUARTER

Chapter 6 - Techniques of Integration

Sections 6.1 - 6.6

Chapter 8 - Trigonometric Functions

Sections 8.3 - 8.6

### **MATERIALS NEEDED:**

Subject notebook for class notes and loose-leaf for homework

Pencils for all tests, quizzes, and exams

Graphing calculator

I suggest the Texas Instruments (TI) family of graphing calculators including the **TI-Nspire handheld** device. Other calculators are acceptable; however, the student must assume responsibility for learning his/her calculator. Calculators may be used during tests, quizzes and exams.

### **GRADING POLICIES:**

- Method of Assessment:  
 Tests.....60% (minimum of three per quarter)  
 Quizzes.....40% (minimum of three per quarter)

Example:

$$\text{Test \#1} = 88\%, \text{ Test \#2} = 75\%, \text{ Test \#3} = 92\% \qquad \text{Test Average} = \frac{88 + 75 + 92}{300} \times .6 = 51.0\%$$

$$\text{Quiz \#1} = 40/50, \text{ Quiz \#2} = 17/20, \text{ Quiz \#3} = 27/35 \qquad \text{Quiz Average} = \frac{40 + 17 + 27}{50 + 20 + 35} \times .4 = 32.0\%$$

$$\text{Quarter Average} = 51.0\% + 32.0\% = 83\%$$

- Each student is responsible for maintaining a Calculus journal that contains class notes and homework assignments. The journal may be collected for evaluation purposes if an academic progress report is requested by the parents or administration.
- Homework problems will be assigned for each section discussed in class. All assignments will be posted daily on the homework hotline. It is expected that you complete all assigned work and keep it chronologically organized in your journal. Questions regarding homework problems should be asked in class. Tutoring is available after school or via e-mail. Homework will **not** be graded.
- Major tests will be announced approximately one week in advance. Quizzes will be announced at least one day in advance and will reflect homework problems. Assessment objectives will be given prior to any written evaluation - i.e., topics to be tested will be clearly stated and reviewed.
- Projects will be assessed as tests or quizzes as specified.
- If you are absent on the day of a test or quiz, you will be required to make up the work on the day you return to class. Assessments missed during an extended absence must be rescheduled within three days of returning to class.
- Students who cut class will receive a zero on any test, quiz, project, exam or extra-credit given that day. The student may request make-up work. It will be given at the administration's discretion. Failure to request the work validates acceptance of the zero.
- All students must take both the midterm and final exams. No exemptions will be approved.

### **CHEATING/PLAGIARISM POLICY:**

Certain assignments require independent work outside the classroom. Unless otherwise specified, students are expected to complete take-home assessments and/or projects on their own merit. Any student caught cheating on a test, quiz, project, or exam both in or outside the classroom; stealing another student's work or ideas, or copying verbatim from a textbook or internet source will receive an F (60%) on that assignment. A second occurrence will result in an F for the marking period.

**This policy may be amended at the discretion of the department chair or an administrator.**

Questions or concerns regarding these policies should be directed to my attention at (610) 868-1431 ext.166 or by e-mailing me at the address listed above. Thank you for your cooperation in reviewing this information with your parents/guardians.

Respectfully,  
 Mrs. Beverly A. Kincaid  
 Math department chairman