

Fall 2015

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| ***Mathematics Department*** | Kelsey Wright |
| Calculus I | Office: Room 103 |
| Math 170 | Wrightk2notusschools.org |
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## Students and Instructors are accountable for all information on the Course Syllabus.

## Instructor Availability

If at anytime, you are in need of my assistance or have any questions for me, feel free to stop by my room before or after school. I am also available by e-mail.

## Course Description

This is the first course in the calculus sequence. It covers alge­braic and transcendental functions, rate of change, limits, continuity, differentiation of algebraic, trig, exponential, loga­rithmic, and hyperbolic functions, differentials, applications of differentiation, definite and indefinite integrals, area between curves, volumes, and other applications of integration, inde­terminate forms, and L’Hôpital’s rule.

PREREQ: Precalculus or its equivalent with a minimum grade of C.

***General Education Competency Area***

This course fulfills the Idaho State General Education competency area of Mathematical Ways of Knowing.

This course meets the following student competencies in fulfillment of State Board of Education policy:

* Read, interpret, and communicate mathematical concepts.
* Represent and interpret information/data.
* Select, execute, and explain appropriate strategies/procedures when solving mathematical problems.
* Apply quantitative reasoning to draw appropriate conclusions and support them.

***Academic Affairs Objectives***

This course meets the following Academic Affairs Objectives:

[x]  **Learn to Learn**. Students learn that as important as content knowledge is, shaping one’s future requires the development of skill in discerning, applying, analyzing, synthesizing and evaluating knowledge in diverse contexts. The educational experience at CWI prepares students for a world in which they are likely to change occupations and face unpredictable life events. We strive to develop courses and learning experiences that give students the tools to confidently thrive in a complex, information-saturated, diverse, and dynamic world.

[x]  **Make Connections**. Students learn success in today’s interconnected world requires deliberate engagement and comfort with multiple perspectives, cultures, and contexts. In navigating difference and diversity in the natural and social worlds, students connect ideas, forms of knowledge, and practices to create a richer understanding of themselves as personally and socially responsible citizens.

[x]  **Solve Problems**. Students identify problems, analyze and implement solutions, and interpret and reflect on outcomes to develop skills to individually and collaboratively face challenges and create opportunities.

[ ]  **Reason Ethically**. Students learn that ethical ideas and moral conduct may be understood from many perspectives: as products of historical, cultural, and religious forces, as reflections of human nature, and as personally held attitudes and beliefs. Students learn to articulate ethical self-awareness, ethical issue recognition, and varieties of ethical perspectives to evaluate, create, and live consciously according to their own personal moral values.

***Course Schedule***

This is a yearlong class. The class will meet Monday through Thursday (School Calendar schedule), 1st period, from 7:45-8:40.

## Course Objectives and Student Learning Outcomes

The Course Objective is to provide students with the mathematical foundation necessary (1) for students majoring in the mathematical and physical sciences, engineering, mathematics education, and related fields, and (2) to be able to develop strong mathematical reasoning skills, clear conceptual understanding, and the ability to think critically.

Students completing this course are expected to acquire the ability and skills to:

* 1. Graph functions, including trigonometric functions.
		1. Find the domain and range of functions and graph functions, including polynomial functions, absolute-value functions, rational functions, square root and cube functions, power functions, algebraic functions, exponential functions, logarithmic functions, and trigonometric functions.
		2. Find sums, differences, products, quotients, and compositions of functions.
		3. Shift, scale, and reflect graphs of functions.
		4. Evaluate trigonometric functions for special angles.
		5. Use trigonometric identities, including the Pythagorean identity, the Addition formulas, the Double-Angle formulas, the Half-Angle formulas, and the Law of Cosines.
		6. Understand the limitations of using a graphing utility, such as choosing an appropriate window and obtaining a complete graph.
		7. Find inverse functions.
		8. Use properties of logarithms.
		9. Graph arcsine and arccosine and identify their domains and ranges.
	2. Find limits and determine whether a function is continuous.
		1. Calculate average and instantaneous rates of change.
		2. Find limits from graphs.
		3. Use the limit laws to calculate limits.
		4. Eliminate common factors to find limits of rational functions.
		5. Find limits of average rates of change.
		6. Use the Sandwich Theorem (aka Squeeze Theorem) to find limits of functions.
		7. Use the formal definition of a limit to prove limit statements.
		8. Find one-sided limits graphically and algebraically.
		9. Use the fact that the limit of the ratio of $\sin(θ )$and $θ$ is $1$, to find limits.
		10. Apply the Continuity Test to determine whether a function is continuous at a point.
		11. Find limits of continuous composite functions.
		12. Apply the Intermediate Value Theorem for continuous functions to find solutions to equations.
		13. Use limits involving infinity to find asymptotes.
	3. Calculate derivatives of functions.
		1. Find the tangent to the graph of a function.
		2. Find the derivative of a function at a given point using the limit of the difference quotient.
		3. Use the alternative formula for the derivative to calculate derivatives.
		4. Identify cases when the derivative does not exist.
		5. Understand the relationship between differentiability and continuity.
		6. Apply differentiation rules for constant functions, powers, sums, differences, products, and quotients of functions.
		7. Calculate higher-order derivatives.
		8. Solve problems involving motion along a line, such as find displacement, average velocity, speed, and acceleration.
		9. Calculate derivatives of trigonometric functions.
		10. Apply the chain rule to find derivatives.
		11. Use implicit differentiation to find derivatives.
		12. Apply the Derivative Rule for Inverses to find derivatives of inverse functions.
		13. Find derivatives of logarithms.
		14. Use logarithmic differentiation to find the derivative.
		15. Find derivatives of inverse trigonometric functions.
		16. Solve related rates problems.
		17. Approximate functions using linearization.
		18. Use differentials to estimate change.
	4. Use derivatives to solve application problems.
		1. Find the absolute extrema of a continuous function.
		2. Find values that satisfy the conclusion of the Mean Value Theorem.
		3. Use the first derivative to determine the local extrema of a function.
		4. Use the second derivative to test for concavity and for local extrema.
		5. Use derivatives to graph functions.
		6. Apply L’Hopital’s Rule to find limits of rational functions having appropriate indeterminant forms.
		7. Solve applied optimization problems, such as minimize perimeter or cost, or maximize volume or profit.
		8. Apply Newton’s Method to approximate roots.
	5. Evaluate integrals.
		1. Find antiderivatives.
		2. Approximate area with finite sums.
		3. Find limits of finite sums.
		4. Use properties of definite integrals to evaluate integrals.
		5. Use definite integrals to find area of nonnegative functions.
		6. Find the average value of a continuous function using a definite integral.
		7. Use the Fundamental Theorem of Calculus to find derivatives of integrals and to evaluate definite integrals using antiderivatives.
		8. Apply the Substitution Method to evaluate indefinite integrals.
		9. Find the area between two curves.
	6. Solve application problems involving definite integrals.
		1. Find the volume of a solid by slicing with parallel planes.
		2. Find the volume of a solid of revolution using the Disk Method
		3. Find the volume of a solid of revolution using the Washer Method.
		4. Find the volume of a solid of revolution using cylindrical shells.
		5. Find work done by a variable force.
		6. Find the work done to pump liquids from containers.
	7. Solve problems involving integrals and transcendental functions.
		1. Evaluate integrals that result in a logarithmic function.
		2. Evaluate integrals that result in an exponential function.
		3. Solve separable differential equations involving exponential change, such as unlimited population growth, radioactivity, and heat transfer.
		4. Find derivatives of hyperbolic and inverse hyperbolic functions.
		5. Compare the growth rates of functions.

***Outcomes Assessment***

The student learning outcomes will be assessed using homework, quizzes, projects, unit tests, and a final exam.

***Grading Policy***

Your overall grade for the course will be calculated using the following categories and weights:

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| **Category** |  | **Weight** |
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| Homework  |  | 20% |
| Quizzes |  | 10% |
| Exams |  | 50% |
| Final Exam  |  | 20% |
|  TOTAL: |   | 100% |
| Letter grades will be determined as follows: |
|  | **A**: | 90-100% |
|  | **B**: | 80-89% |
|  | **C**: | 70-79% |
|  | **D**: | 60-69% |
|  | **F**: | 59% or below |

## Textbooks and Required Materials

The textbook for the course is Calculus Early Transcendental functions 4th edition.

## Course Calendar

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| Fall Semester 2015 | Spring Semester 2016 |
| **Chapter 1-Preparation for Calculus** Review how to find, graph and compare mathematical models for different data sets.Functions: -Combining functions such as shifting and scaling using transformations -Trigonometric Functions -Graphing with a Calculator -Exponential Functions -Inverse Functions and Logarithms | **Chapter 4-Applications of Differentiation**Find extrema on intervals, Rolle’s Theorem and the Mean Theorem, increasing and decreasing functions and the first derivative test, concavity and the second derivative test, limits at infinity, curve sketching, optimization problems, and differentials. -Finding extreme values of a functions (using first derivative) -The Mean Value Theorem -Monotonic Functions and the First Derivative Test -Concavity and Curve Sketching (using first and second derivative) -Indeterminate Forms for Limits and L’Hopital’s Rule -Optimization Problems -Newton’s Method -Beginning Antiderivatives |
| **Chapter 2-Limits and Their Properties** Learning how to find limits of functions analytically, graphically, and numerically. -Limit of a Functions (Limit Laws) -The precise definition of a limit (using epsilon and delta) -One-sided limits -Limits and continuity -Limits involving infinity. (This includes limits where x approaches infinity, and where the limit of the function could be infinity. | **Chapter 5-Integration**Learn how the limit process can be used to find the areas of a side variety of regions, antiderivatives and indefinite integration, area, Riemann sums and definite integrals, the Fundamental Theorem of Calculus, various forms of integration such as integration by substitution, numerical integration, natural logarithmic, inverse trigonometric functions, and hyperbolic functions.  -Estimating an area with finite sums (left hand rule, right hand rule, center rule) -Sigma Notation and limits of finite sums -The Definite Integral -The Fundamental Theorem of Calculus -Indefinite Integrals and the Substitution Method -Finding the area between two curves |
| **Chapter 3-Differentiation** Use limits to find slopes of tangent lines to graphs, find derivatives using rules, using derivatives to find rates of change, implicit differentiation, related rates and Newton’s Method. -Tangent lines and the derivative at a single point -The derivative of a function -The derivative laws -The derivative as a rate of change -Derivative of a trigonometric functions -Implicit differentiation -Derivatives of Inverse Functions and Logarithms -Inverse Trigonometric Functions -Related Rates -The linearization of a function and differentials | **Chapter 7-Applications of Integration**Find area of a region between two curves, volume using the disk and shell methods, arc lengths and surfaces of revolution, work, moments, centers of mass, and centroids. Volume -Finding the volume using cross-sections (This included circular cross-sections) -Finding the volume using Cylindrical Shells -Using integrals to find "Work" and "Fluid Forces." (Such as finding out how much work it takes to empty a swimming pool) |
|  |  **Integrals and Transcendental Functions** -The Logarithm Defined as an integral -Separable Differential Equations -Hyperbolic Functions like sinhx, coshx, tanhx. (derivatives, antiderivatives, identities, etc) -Relative Rates of Growth using little o and big O notation. |
| Cumulative Final during last week of semester. | Cumulative Final during last week of semester. |

**Drop Policy**

## Course Expectations

* Homework will be given every day of class (minus test dates) and will be due the next class period.
* The average student can expect to spend approximately 6-8 hours per week preparing for class.

***Behavioral Expectations***

Every student has the right to a respectful learning environment.  In order to provide this right to all students, students must take individual responsibility to conduct themselves in a mature and appropriate manner and will be held accountable for their behavior.  Students who disrupt the class or behave inappropriately or disrespectfully, as determined by the instructor, may be asked to leave the classroom.

If conduct continues to be an issue, students may be referred to Student Conduct for judicial action. It is the student’s responsibility to check their email to receive notification of any scheduled appointments or other urgent communications.

Any student who has witnessed or experienced a violation of the student code may contact Student Conduct at extension 22305, or email: conduct@cwidaho.cc

***Academic Honesty***:

All work submitted by a student must represent his or her own ideas, concepts, and current understanding. All material found during research must be correctly documented to avoid plagiarism. Cheating or plagiarism in any form is unacceptable and violations may result in disciplinary action ranging from failure of the assignment to failure of the course. Repeated acts of academic dishonesty may have more severe institutional ramifications. The consequences for cheating in this class are listed below: