**Prerequisite:** Algebra

**Text:** Calculus (Early Transcendentals), Eighth Edition, by James Stewart, Cengage, ISBN 978-1-285-74155-0.

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| HOURS | TOPICS | SECTION | HOMEWORK |
| **2-2** | Real Numbers, Sets, Inequalities, Absolute Value | Appendix A | 1-29\*, 47-55\* |
| **1-3** | Coordinate Geometry and Lines | Appendix B | 1-9\*, 21-27\*, 43-51\* |
| **1-4** | Trigonometry | Appendix D | 1-15\* |
| **1-5** | Four Ways to Represent a Function | 1.1 | 3-9\*, 27-35\* |
| **1-6** | Essential Elementary Functions  New Functions from Old | 1.2  1.3 | 1,2  1-5\*, 9-21, 33-41\* |
| **1-7** | Exponentials | 1.4 | 1,2,17-21 |
| **1-8** | Inverse Functions and Logarithms | 1.5 | 21-26,39-46,61-62 |
| **1-9** | Limit Concept; Limit Calculation Laws | 2.1-2.3 | 2.3: 1-31\* |
| **1-10** | Continuity | 2.5 | None |
| **1-11** | Limits at Infinity; Horizontal Asymptotes | 2.6 | 15-29\* |
| **1-12** | Derivatives and Rates of Change | 2.7 | None |
| **1-13** | Derivatives as Functions | 2.8 | 21-29\* |
| **1-14** | Derivatives of Polynomials and Exponential Functions | 3.1 | 3-41\* |
| **1-15** | Product and Quotient Rules | 3.2 | 3-35\* |
| **1-16** | Derivatives of Trigonometric Functions | 3.3 | 1-21\*,27,29 |
| **2-18** | The Chain Rule | 3.4 | 7-45\* |
| **1-19** | Implicit Differentiation | 3.5 | 5-15\*,25,27 |
| **1-20** | Logarithmic Differentiation | 3.6 | 3-25\*,45-49\* |
| **2-22** | Related Rates | 3.9 | 1-19\* |
| **2-24** | Linear Approximations; Differentials; Error Estimation | 3.10 | 1-4,15-18,23-26\* |
| **0-24** | Derivatives of Hyperbolic Functions | 3.11 | None |
| **1-25** | Maximum and Minimum Values | 4.1 | 29-43\*,51-59\* |
| **1-26** | Optimization Problems | 4.7 | 1,3,9,11,12,15,21,23 |
| **1-27** | Mean Value Theorem | 4.2 | 5-13 |
| **1-28** | Indeterminate Forms and L'Hospital's Rule | 4.4 | 9-27\* |
| **1-29** | Anti-derivatives | 4.9 | 1-17\*,27-33\* |
| **1-30** | Areas and Distances | 5.1 | None |
| **1-31** | The Definite Integral | 5.2 | None |
| **1-32** | The Fundamental Theorem of Calculus | 5.3 | 9-35\* |
| **1-33** | Indefinite Integrals and Net Change Theorem | 5.4 | 5-15\*,27-35\* |
| **2-35** | The Substitution Rule (Change of Variable) | 5.5 | 7-33\*,59-65\* |
| **2-37** | Integration by Parts | 7.1 | 1-17\* |
| **1-38** | How Derivatives Affect Graph Shapes | 4.3 | 9-21\* |
| **1-39** | Newton's Method | 4.8 | None |
| **6-45** | Reviews, Exams, Holidays |  |  |

\* Do odd numbered problems in this range.

## Course Objectives

Upon completion of this course, the student should have the following skills.

### Functions and limits

* Use real numbers, inequalities involving real numbers and their absolute values, the trigonometric functions, and the radian measure of angles.
* Be able to move back and forth between the descriptions of a function by an equation, a table, a graph, and by words.
* Be able to use exponential functions, sketch their graphs, and define the number e.
* Define what it means for a function to be one-to-one and determine whether a function has an inverse or not and sketch its inverse if it does.
* Be able to use logarithmic functions, sketch their graphs, and define the relationship between the natural exponential and natural logarithmic functions.
* State in words what it means for a function to have a limit, be able to calculate limits, and be able to find the vertical and horizontal asymptotes of a function.
* State in words what it means for a function to be continuous and be able to find limits for continuous functions.

### Derivatives

* Relate the notions of tangent to a curve, velocity, and rate of change, and illustrate them in a sketch.
* State the definition of derivative as the limit of a difference quotient and explain how the derivative itself can be regarded as a function.
* Be able to find derivatives of polynomials and exponential functions.
* State the product and quotient rules for differentiation and be able to use them to differentiate functions.
* Know the derivatives of sine and cosine and be able to use the quotient rule to determine the derivatives of the remaining four trigonometric functions.
* State the chain rule and use it to differentiate functions obtained by composition.
* Use the differentiation rules to differentiate implicitly, and to find higher order derivatives.
* Be able to differentiate logarithmic functions, and functions involving them.
* Define the hyperbolic functions and be able to differentiate them.

### Applications of Differentiation

* Be able to solve related rates problems. Understand them as an application of the chain rule.
* Understand the connection between the derivative, the tangent line to the graph of a function, the linearization of a function, and the differential of a function.
* Use the differential (or linearization) to solve “small change” and applied approximation problems.
* Be able to state the Mean Value Theorem and give some of its consequences.
* Describe how the signs of the first and second derivatives of a function affect the shape of its graph.
* Define and recognize the various forms of indeterminate forms, and use L’Hospital’s Rule to determine their limits.
* Be able to set up and solve optimization problems using calculus methods.
* Be able to describe Newton’s method geometrically, and to use it to iteratively approximate the zeros of functions.
* Define what the antiderivative of a function is and be able to find it for reasonable functions.

### Integral Calculus

* Describe the connection between the problems of finding areas and distances travelled, and how both problems lead to the same limit.
* Know and be able to work with the properties of definite integrals.
* State the Fundamental Theorem of Calculus in words, describe how it connects integral and differential calculus, and how it helps in finding antiderivatives and in evaluating definite integrals.
* Define the indefinite integral of a function and state its relation to the antiderivative.
* Be able to use the Substitution Rule to evaluate definite and indefinite integrals.
* Be able to use integration by parts to evaluate appropriate integrals.