LSU College Readiness Dual Enrollment Program for Math

COURSE PROFILE

July 2019

**COURSE NAME: LSU Math 1550 Calculus I**

**HIGH SCHOOL COURSE CODE:**

**BOARD OF REGENTS COMMON COURSE NUMBER: CMAT 2115 Calculus I**

**PRIMARY ONLINE CONTENT SOURCE: *Calculus: Early Transcendentals, 3e,* *MyMathLab*,**

**Briggs, Cochran, Gillett, Schultz**

**COURSE/UNIT CREDIT: 5 credit hours, 1 Carnegie Unit**

**GRADE(S): 11 or 12**

**PREREQUISITE(S): ALEKS Calculus Placement Test minimum 70%**

**CHAPTERS**

**2 – Limits**

**3 – Derivatives**

**4 – Applications of the Derivative**

**5 – Integration**

**6 – Applications of Integration**

**SECTION NAMES (NUMBER OF EXERCISES) AND LEARNING OBJECTIVES**

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| **CHAPTER 2: Limits** |
| **2.1 The Idea of Limits (11)**  Apply concepts related to limits  Calculate average and instantaneous velocity  Calculate slopes of secant and tangent lines |
| **2.2 Definitions of Limits (20)**  Apply limit definitions  Find limits from a graph  Estimate limits from a table  Study limits for particular well-known functions |
| **2.3 Techniques for Computing Limits (31)**  Apply techniques for computing limits  Apply limit laws  Evaluate limits  Evaluate one-sided limits  Use the Sandwich Theorem |
| **2.4 Infinite Limits (23)**  Apply properties of infinite limits  Find infinite limits numerically or graphically  Evaluate limits analytically  Find vertical asymptotes |

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| **2.5 Limits at Infinity (27)**  Apply concepts relating to end behavior and horizontal asymptotes  Evaluate limits at infinity  Find horizontal asymptotes of rational functions  Determine end behavior and sketch graphs  Find horizontal and vertical asymptotes  Use limits to find steady states in applications  Find limits of sequences |
| **2.6 Continuity (34)**  Apply the concept of continuity  Find points of discontinuity or intervals of continuity  Determine whether a function is continuous at a point using the continuity checklist  Evaluate limits using principles of continuity  Use the Intermediate Value Theorem  Classify discontinuities |
| **CHAPTER 3: Derivatives** |
| **3.1 Introducing the Derivative (19)**  Review the concept of the derivative  Use limit definitions to find equations of tangent lines.  Understand differentiability and relate it to continuity  Understand derivatives graphically  Solve applications involving basic derivatives |
| **3.2 Working with Derivatives (16)**  Apply concepts related to working with derivatives  Work with the graph of the derivative of a function  Find derivatives of functions using limits  Determine continuity and differentiability and evaluate derivatives  Understand differentiability and relate it to continuity |
| **3.3 Rules of Differentiation (28)**  Use graphs and tables to find derivatives  Find derivatives using rules of differentiation  Simplify products and quotients and find their derivatives  Use derivatives to find slope locations and equations of tangent lines  Find higher-order derivatives of functions  Find limits related to derivatives |

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| **3.4 The Product and Quotient Rules (25)**  Find derivatives of products and quotients of algebraic expressions  Find derivatives using two different methods  Find derivatives using the extended power rule  Find higher order derivatives of products and quotients  Find derivatives of products and quotients using given values or graphs  Find equations of tangent lines |
| **3.5 Derivatives of Trigonometric Functions (22)**  Find derivatives of basic trigonometric functions  Find limits involving trigonometric functions  Find derivatives of products, quotients, and powers of functions with trigonometric expressions.  Find higher order derivatives of functions involving trignometric expressions  Verify statements involving trignometric expressions  Find equations of tangent lines |
| **3.6 Derivatives as Rates of Change (14)**  Apply concepts related to derivatives as rates of change  Relate position, velocity, and acceleration to derivatives  Solve other applications involving derivatives as rates of change |
| **3.7 The Chain Rule (27)**  Apply properties of the chain rule  Find derivatives using the chain rule  Find equations of tangent lines |
| **3.8 Implicit Differentiation (21)**  Apply the concept of implicit differentiation  Find derivatives using implicit differentiation  Find equations of tangent lines using implicit differentiation  Find derivatives of functions with rational exponents  Find tangent and normal lines  Solve applications using implicit differentiation |
| **3.9 Derivatives of Logarithmic and Exponential Functions (31)**  Find derivatives involving logarithms and exponential  Find derivatives using logarithmic differentiation  Evaluate limits of logarithmic and exponential functions using the definition of the derivative |

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| **3.10 Derivatives of Inverse Trig Functions (22)**  Apply concepts relating to the derivatives of inverse trigonometric functions  Find derivatives of functions involving inverse trigonometric functions  Find equations of tangent lines  Find derivatives of general inverse functions  Solve applications involving the rate of change of an angle with respect to a side |
| **3.11 Related Rates (20)**  Solve related rates problems involving geometry  Solve related rates applications for the rate of change of distance, area, or volume  Solve related rates applications for the rate of change of an angle |
| **CHAPTER 4: Applications of the Derivative** |
| **4.1 Maxima and Minima (28)**  Apply concepts related to maxima and minima  Use graphs to illustrate or identify extreme points  Find critical points and extreme points  Solve applications involving extreme points |
| **4.2 Mean Value Theorem (15)**  Apply properties of Rolle's Theorem and the Mean Value Theorem  Find points guaranteed to exist by Rolle's Theorem  Find points guaranteed to exist by the Mean Value Theorem  Solve applications using the Mean Value Theorem |
| **4.3a What Derivatives Tell Us (16)**  Find intervals on which a function is increasing and decreasing  Use the first derivative test to find local and absolute extrema |
| **4.3b What Derivatives Tell Us (19)**  Sketch functions from properties  Determine the concavity on intervals and find inflection points  Use the second derivative test to find local extrema  Compare *f*, *f '*, and *f ''* |
| **4.4 Graphing Functions (19)**  Sketch functions using analytic methods  Graph functions, and find any local extrema and inflection points  Sketch the general graph of functions given the equation of the derivatives |
| **4.5 Optimization Problems (16)**  Apply properties of optimization problems and objective functions  Solve optimization problems involving geometry, number operations, and conic sections  Solve applications by optimizing functions |

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| **4.6 Linear Approximations and Differentials (22)**  Write a linear approximation and estimate the value of a function  Graph a function and its linear approximation to identify underestimates and overestimates  Use linear approximations to estimate a quantity  Use linear approximations to estimate changes in a given variable  Write a differential expression the change in y as a function of the change in x |
| **4.7 L'Hopital's Rule (26)**  Evaluate limits of the form 0/0  Evaluate limits of the form infinity/infinity, 0\*infinity, or infinity-infinity  Evaluate limits of the form 1^infinity, 0^0, or infinity^0  Evaluate limits using the appropriate method |
| **4.8 Newton’s Method (11)**  Given an initial approximation, use Newton’s method to find the first two approximations  Use Newton's method to find solutions to equations |
| **4.9 Antiderivatives (38)**  Find general antiderivatives and indefinite integrals  Find particular antiderivatives and solve initial value problems  Relate solutions to initial value problems to their graphs  Solve applications involving antiderivatives  Find the equation of a curve given information about the derivative  Solve initial value problems |
| **CHAPTER 5: Integration** |
| **5.1 Approximating Areas under Curves (25)**  Apply properties of Riemann sums  Approximate displacement over an interval given a velocity function  Evaluate left, right, and midpoint Riemann sums  Evaluate Riemann sums from tables  Use sigma notation and evaluate expressions in sigma notation  Solve applications using the area under a curve |
| **5.2 Definite Integrals (21)**  Apply properties of net area and definite integrals  Approximate net area given functions  Express Riemann sums as definite integrals  Evaluate definite integrals using geometry  Approximate net area from graphs  Use properties of definite integrals  Evaluate definite integrals using Riemann sums |

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| **5.3 Fundamental Theorem of Calculus (26)**  Apply properties of the Fundamental Theorem of Calculus  Evaluate area functions  Evaluate definite integrals using the Fundamental Theorem of Calculus  Find areas bounded by functions  Evaluate derivatives of definite integrals  Work with area functions and graphs of area functions |
| **5.4 Working with Integrals (14)**  Use symmetry to evaluate definite integrals  Find average values of functions over given intervals  Use the Mean Value Theorem for Integrals  Find average values of functions |
| **5.5a Substitution Rule (22)**  Verify formulas using differentiation  Apply properties of composite functions and the Substitution Rule  Find indefinite integrals using a given substitution  Use a change of variables to find indefinite integrals  Use a change of variables to evaluate definite integrals  Find general antiderivatives and indefinite integrals  Find areas of regions using integration that requires substitution |
| **5.5b Substitution Rule (19)**  Review concepts related to antiderivatives  Use a change of variables to find indefinite integrals  Use a change of variables to evaluate definite integrals  Find general antiderivatives and indefinite integrals  Evaluate definite integrals using the Fundamental Theorem of Calculus  Find particular antiderivatives and solve initial value problems  Find average values of functions over given intervals |
| **CHAPTER 6: Applications of Integration** |
| **6.1 Velocity and Net Change (19)**  Apply properties of velocity and net change  Determine displacement and position from velocity  Find position and velocity from acceleration  Solve applications involving net change and future value |
| **6.2 Regions Between Curves (14)**  Apply concepts associated with the area between two curves  Find the area between two curves  Rewrite areas by changing the variable of integration |
| **6.3 Volumes by Slicing (22)**  Apply concepts associated with finding volumes by slicing  Use the general slicing method to find volumes of solids  Use the disk method to find volumes of solids  Use the washer method to find volumes of solids  Find volumes of solids using an appropriate method  Compare volumes of solids |

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| **6.4 Volume by Shells (15)**  Use the shell method to find volumes of solids generated by revolving a region about the *y*-axis  Use the shell method to find volumes of solids generated by revolving a region about the *x*-axis  Use the shell method to find volumes of solids  Find volumes of solids using an appropriate method |
| **6.5 Length of Curves (9)**  Find arc lengths by integrating with respect to *x*  Solve applications involving arc length |
| **6.7 Density and Mass (12)**  Apply concepts associated with mass, work, and force  Find the mass of thin bars with given density functions  Solve applications involving work  Solve applications involving force |