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 limitsCalculate average and instantaneous velocityCalculate slopes of secant and tangent lines |
| **2.2 Definitions of Limits (20)**Apply limit definitionsFind limits from a graphEstimate limits from a tableStudy limits for particular well-known functions |
| **2.3 Techniques for Computing Limits (31)**Apply techniques for computing limitsApply limit lawsEvaluate limits Evaluate one-sided limitsUse the Sandwich Theorem |
| **2.4 Infinite Limits (23)**Apply properties of infinite limitsFind infinite limits numerically or graphicallyEvaluate limits analyticallyFind vertical asymptotes |

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| **2.5 Limits at Infinity (27)**Apply concepts relating to end behavior and horizontal asymptotesEvaluate limits at infinityFind horizontal asymptotes of rational functionsDetermine end behavior and sketch graphsFind horizontal and vertical asymptotesUse limits to find steady states in applicationsFind limits of sequences |
| **2.6 Continuity (34)**Apply the concept of continuityFind points of discontinuity or intervals of continuityDetermine whether a function is continuous at a point using the continuity checklistEvaluate limits using principles of continuityUse the Intermediate Value TheoremClassify discontinuities |
| **CHAPTER 3: Derivatives** |
| **3.1 Introducing the Derivative (19)**Review the concept of the derivativeUse limit definitions to find equations of tangent lines. Understand differentiability and relate it to continuityUnderstand derivatives graphicallySolve applications involving basic derivatives |
| **3.2 Working with Derivatives (16)**Apply concepts related to working with derivativesWork with the graph of the derivative of a functionFind derivatives of functions using limitsDetermine continuity and differentiability and evaluate derivativesUnderstand differentiability and relate it to continuity |
| **3.3 Rules of Differentiation (28)**Use graphs and tables to find derivativesFind derivatives using rules of differentiationSimplify products and quotients and find their derivativesUse derivatives to find slope locations and equations of tangent linesFind higher-order derivatives of functionsFind limits related to derivatives |

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| **3.4 The Product and Quotient Rules (25)**Find derivatives of products and quotients of algebraic expressionsFind derivatives using two different methodsFind derivatives using the extended power ruleFind higher order derivatives of products and quotientsFind derivatives of products and quotients using given values or graphsFind equations of tangent lines |
| **3.5 Derivatives of Trigonometric Functions (22)**Find derivatives of basic trigonometric functionsFind limits involving trigonometric functionsFind derivatives of products, quotients, and powers of functions with trigonometric expressions.Find higher order derivatives of functions involving trignometric expressionsVerify statements involving trignometric expressionsFind equations of tangent lines  |
| **3.6 Derivatives as Rates of Change (14)**Apply concepts related to derivatives as rates of changeRelate position, velocity, and acceleration to derivativesSolve other applications involving derivatives as rates of change |
| **3.7 The Chain Rule (27)**Apply properties of the chain ruleFind derivatives using the chain ruleFind equations of tangent lines |
| **3.8 Implicit Differentiation (21)**Apply the concept of implicit differentiationFind derivatives using implicit differentiationFind equations of tangent lines using implicit differentiationFind derivatives of functions with rational exponentsFind tangent and normal linesSolve applications using implicit differentiation |
| **3.9 Derivatives of Logarithmic and Exponential Functions (31)**Find derivatives involving logarithms and exponentialFind derivatives using logarithmic differentiationEvaluate 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 functionsFind derivatives of functions involving inverse trigonometric functionsFind equations of tangent linesFind derivatives of general inverse functionsSolve applications involving the rate of change of an angle with respect to a side |
| **3.11 Related Rates (20)**Solve related rates problems involving geometrySolve related rates applications for the rate of change of distance, area, or volumeSolve 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 minimaUse graphs to illustrate or identify extreme pointsFind critical points and extreme pointsSolve applications involving extreme points |
| **4.2 Mean Value Theorem (15)**Apply properties of Rolle's Theorem and the Mean Value TheoremFind points guaranteed to exist by Rolle's TheoremFind points guaranteed to exist by the Mean Value TheoremSolve applications using the Mean Value Theorem |
| **4.3a What Derivatives Tell Us (16)**Find intervals on which a function is increasing and decreasingUse the first derivative test to find local and absolute extrema |
| **4.3b What Derivatives Tell Us (19)**Sketch functions from propertiesDetermine the concavity on intervals and find inflection pointsUse the second derivative test to find local extremaCompare *f*, *f '*, and *f ''* |
| **4.4 Graphing Functions (19)**Sketch functions using analytic methodsGraph functions, and find any local extrema and inflection pointsSketch the general graph of functions given the equation of the derivatives |
| **4.5 Optimization Problems (16)**Apply properties of optimization problems and objective functionsSolve optimization problems involving geometry, number operations, and conic sectionsSolve 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 functionGraph a function and its linear approximation to identify underestimates and overestimatesUse linear approximations to estimate a quantityUse linear approximations to estimate changes in a given variableWrite 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 0/0Evaluate limits of the form infinity/infinity, 0\*infinity, or infinity-infinityEvaluate limits of the form 1^infinity, 0^0, or infinity^0Evaluate limits using the appropriate method |
| **4.8 Newton’s Method (11)**Given an initial approximation, use Newton’s method to find the first two approximationsUse Newton's method to find solutions to equations |
| **4.9 Antiderivatives (38)**Find general antiderivatives and indefinite integralsFind particular antiderivatives and solve initial value problemsRelate solutions to initial value problems to their graphsSolve applications involving antiderivativesFind the equation of a curve given information about the derivativeSolve initial value problems |
| **CHAPTER 5: Integration** |
| **5.1 Approximating Areas under Curves (25)**Apply properties of Riemann sumsApproximate displacement over an interval given a velocity functionEvaluate left, right, and midpoint Riemann sumsEvaluate Riemann sums from tablesUse sigma notation and evaluate expressions in sigma notationSolve applications using the area under a curve |
| **5.2 Definite Integrals (21)**Apply properties of net area and definite integralsApproximate net area given functionsExpress Riemann sums as definite integralsEvaluate definite integrals using geometryApproximate net area from graphsUse properties of definite integralsEvaluate definite integrals using Riemann sums |

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| **5.3 Fundamental Theorem of Calculus (26)**Apply properties of the Fundamental Theorem of CalculusEvaluate area functionsEvaluate definite integrals using the Fundamental Theorem of CalculusFind areas bounded by functionsEvaluate derivatives of definite integralsWork with area functions and graphs of area functions |
| **5.4 Working with Integrals (14)**Use symmetry to evaluate definite integralsFind average values of functions over given intervalsUse the Mean Value Theorem for IntegralsFind average values of functions |
| **5.5a Substitution Rule (22)**Verify formulas using differentiationApply properties of composite functions and the Substitution RuleFind indefinite integrals using a given substitutionUse a change of variables to find indefinite integralsUse a change of variables to evaluate definite integralsFind general antiderivatives and indefinite integralsFind areas of regions using integration that requires substitution |
| **5.5b Substitution Rule (19)**Review concepts related to antiderivativesUse a change of variables to find indefinite integralsUse a change of variables to evaluate definite integralsFind general antiderivatives and indefinite integralsEvaluate definite integrals using the Fundamental Theorem of CalculusFind particular antiderivatives and solve initial value problemsFind 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 changeDetermine displacement and position from velocityFind position and velocity from accelerationSolve applications involving net change and future value |
| **6.2 Regions Between Curves (14)**Apply concepts associated with the area between two curvesFind the area between two curvesRewrite areas by changing the variable of integration |
| **6.3 Volumes by Slicing (22)**Apply concepts associated with finding volumes by slicingUse the general slicing method to find volumes of solidsUse the disk method to find volumes of solidsUse the washer method to find volumes of solidsFind volumes of solids using an appropriate methodCompare 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*-axisUse the shell method to find volumes of solids generated by revolving a region about the *x*-axisUse the shell method to find volumes of solidsFind 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 forceFind the mass of thin bars with given density functionsSolve applications involving workSolve applications involving force |