**LSU College Readiness Program**

**COURSE PROFILE**

**2-17-2017**

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| **COURSE NAME** | **LSU Math 1550 Calculus I** |
| **COMMON COURSE NUMBER** | **CMAT 2115 Calculus I** |
| **PRIMARY ONLINE CONTENT SOURCE** | ***Calculus: Early Transcendentals, 2e,* *MyMathLab***  Briggs, Cochran, Gillett, Schultz |
| **COURSE/UNIT CREDIT** | **5 credit hours, 1 Carnegie Unit** |
| **GRADE(S)** | **11 or 12** |
| **PREREQUISITE(S)** | **ALEKS Calc Placement Test min 70%** |

**CHAPTERS**

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| **2 – Limits** | **5 – Integration** |
| **3 – Derivatives** | **6 – Applications of Integration** |
| **4 – Applications of the Derivative** |  |

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

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| **CHAPTER 2: Limits** |
| **2.1 The Idea of Limits (9)**  Apply concepts related to limits  Calculate average and instantaneous velocity  Calculate slopes of secant and tangent lines |
| **2.2 Definitions of Limits (18)**  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 (29)**  Apply techniques for computing limits  Apply limit laws  Evaluate limits  Evaluate one-sided limits  Use the Sandwich Theorem |
| **2.4 Infinite Limits (21)**  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 (24)**  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 (32)**  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 |
| **\*2.7 Precise Definition of Limits (17)**  Apply concepts related to the precise definitions of limits  Determine a value for delta from a graph  Write a proof for a given finite limit  Write a proof for one-sided limits or limits involving infinity  Write a proof that a given limit does not exist |
| **CHAPTER 3: Derivatives** |
| **3.1 Introducing the Derivative (19)**  Review the concept of the derivative  Evaluate derivatives and work with equations of tangent lines  Understand differentiability and relate it to continuity  Understand derivatives graphically  Solve applications involving basic derivatives |
| **3.2 Working with Derivatives (10)**  Apply concepts related to working with derivatives  Work with the graph of the derivative of a function  Determine continuity and differentiability and evaluate derivatives  Understand differentiability and relate it to continuity |
| **3.3 Rules of Differentiation (25)**  Find the derivatives of power and constant functions  Find the derivatives of constant multiples of functions  Find the derivatives of the sum of functions  Simplify products and quotients and find their derivatives  Use derivatives to find slope locations, tangent lines, and other derivatives  Find higher-order derivatives  Find limits related to derivatives  Solve applications involving rules of differentiation |

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| **3.4 The Product and Quotient Rules (22)**  Apply concepts relating to the power, exponential, product, and quotient rules  Find derivatives using two different methods  Find derivatives of products  Find derivatives of quotients  Find equations of tangent lines  Find derivatives using the extended power rule  Solve applications involving the product rule and quotient rule  Find derivatives of functions that involve a combination of rules |
| **3.5 Derivatives of Trigonometric Functions (26)**  Apply concepts related to the derivatives of trigonometric functions  Find limits involving trigonometric functions  Find derivatives involving trigonometric functions  Use derivatives of trigonometric functions to solve problems |
| **3.6 Derivatives as Rates of Change (13)**  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  Use derivatives of trigonometric functions to solve problems |
| **3.7 The Chain Rule (25)**  Apply properties of the chain rule  Use version 1 of the chain rule to calculate derivatives  Use version 2 of the chain rule to calculate derivatives  Find derivatives using the chain rule  Solve applications involving the chain rule |
| **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 |
| **3.9a Derivatives of Natural Logs (19)**  Find derivatives involving logarithms or *b^x*  Find derivatives using the appropriate rule or method  Find tangent lines using logarithmic differentiation  Find derivatives using logarithmic differentiation  Evaluate limits of logarithmic and exponential functions using the definition of the derivative |
| **3.9b Derivatives of Natural Exponentials (17)**  Review the rules of differentiation  Review concepts relating to the power, exponential, product, and quotient rules  Find derivatives of products  Find derivatives of quotients  Find derivatives of functions that involve exponentials  Solve applications involving the product rule and quotient rule  Find derivatives using the chain rule  Solve applications involving the chain rule  Find derivatives involving trigonometric functions  Find equations of tangent lines |
| **3.9c Derivatives of Bases Other Than e (12)**  Review the properties of derivatives of logarithmic and exponential functions  Find derivatives involving logarithms or *b^x*  Find derivatives using the appropriate rule or method |
| **3.10 Derivatives of Inverse Trig Functions (16)**  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 (16)**  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 (22)**  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 |
| **4.2a What Derivatives Tell Us (14)**  Apply the concepts related to what a derivative tells us  Sketch functions from properties  Compare *f*, *f '*, and *f ''*  Determine intervals on which a function is increasing and decreasing  Use the first derivative test to find extreme points |
| **4.2b What Derivatives Tell Us (16)**  Review the concepts related to what a derivative tells us  Sketch functions from properties  Determine the concavity on intervals and find inflection points  Use the second derivative test to find extreme points  Compare *f*, *f '*, and *f ''* |
| **4.3 Graphing Functions (18)**  Review concepts related to graphing functions  Sketch curves with given properties  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  Identify properties of the graphs of functions  Sketch special curves or curves used in applications |
| **4.4 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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| **4.5 Linear Approximations and Differentials (21)**  Apply concepts related to linear approximation and differentials  Write, graph, and use the linear approximation equation  Use linear approximations to estimate a quantity  Solve applications by estimating the change in a given variable  Write the formula for *dy* for a given function |
| **4.6 Mean Value Theorem (16)**  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 |
| **4.7 L'Hopital's Rule (24)**  Apply the properties of L'Hopital's rule  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 (10)**  Apply the properties of Newton's method  Use Newton's method to approximate roots and reciprocals  Use Newton's method to find intersection points  Use Newton's method and curve sketching to find extreme points |
| **4.9 Antiderivatives (33)**  Apply concepts related to antiderivatives  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 (19)**  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 (19)**  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 (27)**  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 (15)**  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 (25)**  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 (21)**  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 (13)**  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 (16)**  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 (16)**  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 (14)**  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 (11)**  Find arc lengths by integrating with respect to *x*  Solve applications involving arc length |
| **\*6.6 Surface Area (10)**  Apply concepts associated with surface area  Find surface areas of curves revolved about the *x*-axis  Find surface areas of curves revolved about the *y*-axis  Solve applications involving surface area |
| **\*6.7 Density and Mass (16)**  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 |
| **\*6.8 Log and Exponential Functions (15)**  Review concepts associated with logarithmic and exponential functions  Evaluate derivatives of logarithmic and exponential functions  Evaluate integrals of logarithmic and exponential functions |
| **\*6.9 Exponential Models (7)**  Solve exponential growth problems  Solve exponential decay problems  Apply concepts associated with exponential growth and decay  Solve applications involving exponential growth and decay |
| **\*6.10 Hyperbolic Functions (16)**  Apply concepts associated with hyperbolic functions  Verify identities involving hyperbolic functions  Work with derivatives of hyperbolic functions  Work with integrals of hyperbolic functions  Solve applications involving hyperbolic functions |