TMM013 – Business Calculus (Updated June 3, 2015)

Typical Range: 5-6 Semester Hours

In a Business Calculus course, students should:

- develop mathematical thinking and communication skills and learn to apply precise, logical reasoning to problem solving.
- be able to communicate the breadth and interconnections of the mathematical sciences through being presented key ideas and concepts from a variety of perspectives, a broad range of examples and applications, connections to business and other subjects, and contemporary topics and their applications.
- experience geometric as well as algebraic viewpoints and approximate as well as exact solutions.
- use computer technology to support problem solving and to promote understanding, as most calculus students, especially those who may take only one semester, profit from the use of a graphing utility and a tool for numerical integration.

– Adapted from the MAA/CUPM 2004 Curriculum Guide

To qualify for TMM 013 (Business Calculus), a course must cover as a minimum the essential learning outcomes, noted by an asterisk. A course in Business Calculus may also commonly include some of the listed nonessential learning outcomes. These optional topics should be included only if there is adequate course time to do so beyond giving primary course attention to the essential learning outcomes. At least 70% of the classroom instructional time has to be spent on the essential learning outcomes. The optional learning outcomes are learning experiences that enhance, reinforce, enrich or are further applications of the essential learning outcomes. If review of prerequisite course content is necessary, only a minimal amount of time should be devoted to such review.
The successful Business Calculus student should be able to apply the following competencies to a wide range of functions, including piecewise, polynomial, rational, algebraic, exponential and logarithmic:

1. **Demonstrate an understanding of limits and continuity:**

   1.01 Determine limits analytically, numerically and graphically including one-sided limits and limits at infinity.*

   1.02 Analyze the limit behavior of a function at a point in its domain to determine if the function is continuous at that point. Determine intervals in which a function is continuous. Analyze and classify the discontinuities of a function.*

2. Demonstrate an understanding of derivatives and the ability to compute derivatives:

2.01 Use the limit definition of the derivative to determine the existence and to find the derivative of a given function.*

2.02 Find the derivative of a function by identifying and applying the appropriate derivative formula.*

2.03 Find higher order derivatives.*

3. Understand the interpretation of derivatives and their applications in a business environment:

3.01 Interpret the derivative as a rate of change.*

3.02 Find the slope of the tangent line to the graph of a function at a given point.*

3.03 Use the first derivative to determine intervals on which the graph of a function is increasing or decreasing and to determine critical points of the function.*

3.04 Use the second derivative to determine intervals on which the graph of a function is concave upwards or concave downwards and to determine points of inflection.*

3.05 Find and classify relative extrema and, on a closed interval, absolute extrema of a function.*

3.06 Solve applied problems including marginal analysis applications.*

3.07 Explain the relationship between marginal cost and average cost.*

3.08 Determine and discuss the elasticity of demand for a product.

4. Understand the concept of integration and demonstrate ability to find indefinite and definite integrals apply those results to the business setting:

4.01 Construct antiderivates analytically.*

4.02 Find indefinite integrals using integration formulas and the method of substitution.*

4.03 Find indefinite integrals using integration by parts.

4.04 Identify definite integrals of functions as the areas of regions between the graph of the function and the x-axis.*

4.05 Estimate the numerical value of a definite integral using a Riemann sum.

4.06 Understand and use the Fundamental Theorem of Calculus to evaluate definite integrals.*

4.07 Use definite integrals to calculate the area of the region under a curve and the area of the region between two curves.*

4.08 Determine present value and future value for an investment with interest compounded continuously.*

4.09 Determine the average value of a function on an interval.

4.10 For given supply and demand functions find and interpret the consumer's surplus and the producer's surplus.*

5. Demonstrate an understanding of functions of two variables:

5.01 Find the domain of a function of two variables.

5.02 Interpret contour diagrams for functions of two variables.

5.03 Compute partial derivatives of functions of two variables algebraically.

5.04 Determine critical points for functions of two variables.

5.05 Use the second derivative test to determine the nature of critical points of a function of two variables.

5.06 Use the method of Lagrange multipliers to determine extreme values of functions of two variables subject to constraints.

5.07 Solve applied problems involving the Cobb-Douglas production functions.