MAT 140 SYLLABUS - ANALYTIC GEOMETRY AND CALCULUS I

ANDREW SCHWARTZ, PH.D.

Catalog Description: 140-04 Analytic Geometry and Calculus I (Fall 2010)
Analytic geometry, functions, limits, derivatives and integrals of algebraic, trigonometric, and exponential functions with applications. Prerequisites: MA 133 with a grade of C or higher and MA 134 with a grade of 'C' or higher, or MA 135 with a grade of 'C' or higher. (5)

Text: Stewart, James (2008) *Single Variable Calculus: Early Transcendentals* (Sixth Edition), Belmont, CA: Brooks/Cole-Thomson Learning.

Office Location and Hours: Johnson Hall 307 – WR 2:25pm-3:55pm and whenever I'm around (I want you to always feel free to stop by and see if I'm in. If I'm not, see if the Mathematics Learning Center can help with your question. If none of these times or situations work for you, you can make an appointment that is an appropriate time for the both of us.)

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Classroom Location and Hours: JH 101 – MTWRF 1:30pm-2:20pm

Class Webpage: http://cstl-csm.semo.edu/aschwartz/ma140fa10

Course Objectives: This course, MA145, and MA240 form the three course Analytic Geometry and Calculus sequence. The purpose of this sequence overall is to give students a working knowledge of the above, particularly the limit, the derivative, the integral, basic sequences, and basic series and their analysis. The theory behind the derivative and definite integral will be discussed and students may be expected to compute (for example) simple derivatives using only the definition. Overall, however, the course emphasizes techniques rather than theory. Trigonometric, polynomial, rational, radical, exponential, and logarithmic functions are covered.

Upon completion of this course in particular, you should be able to (among others):

- Find one or two-sided limits of a function $f(x)$ as x approaches a real number, a, evaluate limits at infinity and infinite limits.
- Interpret continuity and limits in a graphical context.
- Interpret the derivative both as the slope of a tangent line and as instantaneous rate of change; find average and instantaneous rates of change.
- Find derivatives of algebraic, logarithmic, exponential, and trigonometric functions. Demonstrate knowledge of the sum, difference, product, quotient, and chain rules for derivatives.
- Find an equation of the tangent line to the graph of a function at a given point.
- Find higher order derivatives for a given function.
- Apply derivatives to solve 'real life' problems.

Date: Fall 2010.

- Recognize and interpret the relationships among f, f', and f'', in a graphical context. Be able to sketch the graph of the function.
- Find integrals of polynomial, rational, logarithmic, exponential, and trigonometric functions.
- Evaluate definite integrals. Be able to apply definite integrals especially in a business context.

Tentative Schedule:

(1) Intro, Syllabus
(2) 1.1 Functions and Models: Four Ways to Represent a Function # 2, 6, 8, 16, 20, 24, 30, 36, 38, 66
(3) 1.2 Functions and Models: Mathematical Models: A Catalog of Essential Functions # 2, 4, 8, 12, 16
(4) 1.3 Functions and Models: New Functions from Old Functions # 2, 4, 10, 16, 22, 30, 32, 36, 40, 50
(5) 1.4 Functions and Models: Graphing Calculators and Computers # 2, 4, 6, 8, 10, 12, 16, 18, 20, 32
(6) 1.5 Functions and Models: Exponential Functions # 2, 4, 6, 8, 10, 14, 16, 18, 22, 26
(7) 1.6 Functions and Models: Inverse Functions and Logarithms # 8, 12, 16, 18, 20, 22, 36, 52, 54, 66
(8) REVIEW over Chapter 1
(9) TEST over Chapter 1
(10) 2.1 Limits and Derivatives: The Tangent and Velocity Problems # 2, 4, 6, 8, 9
(11) 2.2 Limits and Derivatives: The Limit of a Function # 2, 4, 6, 8, 14, 18, 22, 26, 28, 32
(12) 2.3 Limits and Derivatives: Calculating Limits Using the Limit Laws # 4, 8, 14, 18, 24, 26, 30, 36, 46, 48
(13) 2.4 Limits and Derivatives: The Precise Definition of a Limit # 2, 16, 22, 24, 26, 32
(14) 2.5 Limits and Derivatives: Continuity # 4, 6, 10, 16, 20, 24, 32, 36, 38, 48 (bank)
(15) 2.6 Limits and Derivatives: Limits at Infinity; Horizontal Asymptotes # 4, 6, 8, 14, 18, 20, 30, 34, 40, 42
(16) 2.7 Limits and Derivatives: Derivatives and Rates of Change # 4, 6, 10, 28, 30 (bank)
(17) 2.8 Limits and Derivatives: The Derivative as a Function # 2, 4, 22, 24, 26
(18) 2.1-2.8 - to be determined by class
(19) 2.1-2.8 - to be determined by class
(20) 2.1-2.8 - to be determined by class
(21) REVIEW over Chapter 2 (bank)
(22) TEST over Chapter 2
(23) 3.1 Differentiation Rules: Derivatives of Polynomials and Exponential Functions # 8, 12, 16, 22, 24, 30, 34, 46, 48, 52
(24) 3.2 Differentiation Rules: The Product and Quotient Rules # 4, 6, 8, 10, 12, 14, 24, 28, 30, 44
(25) 3.3 Differentiation Rules: Derivatives of Trigonometric Functions # 2, 6, 8, 10, 14, 16, 24, 26, 40, 46

(26) 3.4 Differentiation Rules: The Chain Rule # 6, 8, 12, 16, 26, 34, 36, 42, 48, 62
(27) 3.5 Differentiation Rules: Implicit Differentiation # 2, 6, 8, 10, 12, 14, 18, 26, 30, 34 (bank)
(28) 3.6 Differentiation Rules: Derivatives of Logarithmic Functions # 4, 6, 10, 12, 20, 24, 28, 38, 42, 46
(29) 3.7 Differentiation Rules: Rates of Change in the Natural and Social Sciences # 6, 10, 16, 20, 30 (bank)
(30) 3.8 Differentiation Rules: Exponential Growth and Decay # 2, 4, 6, 8, 10 (bank)
(31) 3.9 Differentiation Rules: Related Rates # 14, 16, 18, 20, 28
(32) 3.10 Differentiation Rules: Linear Approximations and Differentials # 2, 4, 12, 14, 16, 18, 20, 22, 24, 28
(33) 3.11 Differentiation Rules: Hyperbolic Functions # 2, 4, 8, 12, 18, 20, 30, 34, 38, 46 (bank)
(34) 3.1-3.11 - to be determined by class
(35) 3.1-3.11 - to be determined by class
(36) 3.1-3.11 - to be determined by class
(37) 3.1-3.11 - to be determined by class
(38) 3.1-3.11 - to be determined by class
(39) 3.1-3.11 - to be determined by class
(40) REVIEW over Chapter 3 (bank)
(41) TEST over Chapter 3
(42) 4.1 Applications of Differentiation: Maximum and Minimum Values # 4, 6, 8, 18, 24, 32, 36, 42, 50, 54
(43) 4.2 Applications of Differentiation: The Mean Value Theorem: # 2, 4, 6, 12, 14
(44) 4.3 Applications of Differentiation: How Derivatives Affect the Shape of a Graph # 8, 10, 12, 14, 18, 24, 38, 40, 44, 46 (bank)
(45) 4.4 Applications of Differentiation: Indeterminate Forms and L'Hospital's Rule # 6, 10, 12, 18, 20, 22, 28, 34, 40, 60
(46) 4.5 Applications of Differentiation: Summary of Curve Sketching # 10, 12, 18, 26, 30
(47) 4.6 Applications of Differentiation: Graphing with Calculus and Calculators # 2, 12, 14, 26, 30
(48) 4.7 Applications of Differentiation: Optimization Problems # 6, 12, 14, 26, 32 (bank)
(49) 4.8 Applications of Differentiation: Newton's Method # 6, 8, 12, 14, 18
(50) 4.9 Applications of Differentiation: Antiderivatives # 2, 4, 6, 8, 10, 12, 14, 16, 18, 20
(51) 4.1-4.9 - to be determined by class
(52) 4.1-4.9 - to be determined by class
(53) 4.1-4.9 - to be determined by class
(54) 4.1-4.9 - to be determined by class
(55) REVIEW over Chapter 4 (bank)
(56) TEST over Chapter 4
(57) 5.1 Integrals: Areas and Distances # 2, 4, 6, 8, 12