DE LA SALLE UNIVERSITY
College of Science
Department of Mathematics

MATH113 – *Analysis 1*
Prerequisite:MATH111 *Prerequisite to: MATH114*

Instructor:_____ **Contact details:**_____
Consultation Hours:_____ **Class Schedule and Room:**_____

Course Description

This is 1st course in Analysis covering basic concepts of plane analytic geometry, limits and continuity, derivatives and their applications.

Learning Outcomes

On completion of this course, the student is expected to present the following learning outcomes in line with the Expected Lasallian Graduate Attributes (ELGA)

ELGA	Learning Outcome
Critical and Creative Thinker Effective Communicator Lifelong Learner Service-Driven Citizen	At the end of the course, the student will be able to apply limits, continuity and differentiation in solving various conceptual and real-world problems.

As evidence of attaining the above learning outcomes, the student is required to submit the following during the indicated dates of the term.

Learning Outcome	Required Output	Due Date
At the end of the course, the student will be able to apply limits, continuity and differentiation in solving various conceptual and real-world problems.	Collaborative activity on sketching the graph of conic sections and other functions using graphmatica software.	Week 3
	Collaborative activity on solving optimization problems, rate of change and related rates problems.	1 week before final exam

Rubric for assessment

CRITERIA	Excellent (4)	Good (3)	Satisfactory (2)	Needs Improvement (1)
Understanding (50%)	The solution shows a deep understanding of the problem including the ability to identify the appropriate mathematical concepts and information necessary for its solution.	The solution shows that student has a broad understanding of the problem and the major concepts necessary for its solution.	The solution is not complete indicating that parts of the problem are not understood.	There is no solution, or the solution has no relationship to the task.
Strategies and Procedures (15%)	Uses a very efficient strategy leading directly to a solution. Applies procedures accurately to correctly solve the problem and verifies the result.	Uses strategy that leads to a solution of the problem. All parts are correct and a correct answer is achieved.	Uses a strategy that is partially useful, leading some way toward a solution but not to a full solution of the problem. Some parts may be correct but a correct answer is not achieved.	No evidence of a strategy or procedure uses strategy that does not help solve the problem.
Communication (10%)	There is a clear, effective explanation, detailing how the problem is solved. There is a precise and appropriate use of mathematical terminology and notation.	There is a clear explanation and appropriate use of accurate mathematical representation.	There is some use of appropriate mathematical representation but explanation is incomplete and not clearly presented.	There is no explanation or the solution cannot be understood or it is unrelated to the problem.

Integration (10%)	Demonstrates integration of the concepts presented	Demonstrates some integration of the concepts presented	Demonstrates limited integration of the concepts presented	Demonstrates no integration of the concepts presented
Accuracy of Computations/ Solutions (15%)	Computations / solutions are correct and explained correctly	Computations/ solutions are correct but not explained well.	Computations/ solutions have some errors.	Incorrect computations/ solutions

Additional Requirements

At least 4 quizzes, 1 final exam, Seatwork, Assignments, Recitation, Group Work

Grading System

	FOR EXEMPTED STUDENTS (w/out Final Exam)	**FOR STUDENTS with FINAL EXAM**	
		with no missed quiz	*With one missed quiz*
Average of quizzes	95%	65%	55%
Seatwork, Assignment, Learning Output	5%	5%	5%
Final exam	-	30%	40%

Scale:

95-100%	4.0
89-94%	3.5
82-88%	3.0
78-82%	2.5
72-77%	2.0
66-71%	1.5
60-65%	1.0
<60%	0.0

Learning Plan

Learning Outcome	Culminating Topics	Week No.	Learning Activities
At the end of the course, the students will apply appropriate mathematical concepts, processes, tools, and technologies in the solution to various conceptual and real-world problems.	**I. ANALYTIC GEOMETRY** 1.1 Coordinates 1.2 Parabolas 1.3 Ellipses 1.4 Hyperbolas	Week 1-2	• Sketch conic sections. • *Outside activity:* Explore ***Graphmatica*** to examine graphs of parabolas, ellipses and hyperbolas and other equations. • Set up framework for application to future concepts.

	II. FUNCTIONS, LIMITS AND CONTINUITY
	2.1 Functions and their Graphs (special functions)
	2.2 Graphical Approach to Limits of Functions
	2.3 Definition of the Limit of a Function and Limit Theorems
	2.4 One-sided Limits
	2.5 Infinite Limits (vertical asymptotes)
	2.6 Limits at Infinity (horizontal /oblique asymptotes)
	2.7 Continuity of a Function at a Number
	2.8 Continuity of a Composite Function, Continuity on an Interval and the Intermediate Value Theorem
	2.9 Continuity of Trigonometric Functions and the Squeeze Theorem
		Week 2-5	• Introduce use of math software to sketch graphs of some special functions.
			• Give an overview of the nature of limits and its role in calculus.
			Outside activity: The students may be asked to read the discussion on of the nature of limits at the website *analyzemath.com/c/calculus/limits*
			• Introduce the concept of limits using intuitive and graphical approach.
			• Rigorous discussion on the definition of limits using epsilon and delta.
			• Use appropriate theorems in evaluating limit of several types of functions.
			• Discuss continuity of functions at a point and on an interval and its implications. (graphs & Intermediate Value Theorem)
			• Illustrate the squeeze theorem.
			• *Pre-discussion exercises, instruction add-ons and practice exercises may be taken from the following sites*
			  • analyzemath.com/calculus/limits
			  • archives.math.utk.edu/visual.calculus
			  • tutorial.math.lamar.edu

	III. THE DERIVATIVE AND DIFFERENTIATION
	3.1 The Tangent Line and the Derivative
	3.2 Differentiability and Continuity
	3.3 Theorems on Differentiation of Algebraic Functions & Higher-Order Derivatives
	3.4 Derivatives of Trigonometric Functions
	3.5 The Derivative of a Composite Function and the Chain Rule
	3.6 The Derivative of the Power Function for Rational Exponents and Implicit Differentiation
	3.7 Rectilinear Motion and Derivatives as Rate of Change
		Week 6-9	• Introduce the notion of tangent line to a curve at a point using graphical and intuitive approach.
			• Define the derivative of a function and relate it to the concept of the slope of the tangent line to a curve at a point.
			• Examine relationship between continuity and differentiability.
			• Apply differentiation theorems on algebraic and trigonometric functions.
			• Discuss the chain rule as applied to algebraic functions and the chain rule in general.
			• Discuss implicit differentiation for implicit functions.
			• Illustrate the interpretation of derivative as rate of change and its various practical applications.
			• *Pre-discussion exercises, instruction add-ons and practice exercises may be taken from the following sites*
			  • analyzemath.com/calculus
			  • archives.math.utk.edu/visual. calculus
			  • tutorial.math.lamar.edu

	IV. BEHAVIOR OF FUNCTIONS AND THEIR GRAPHS, EXTREME FUNCTION VALUES AND APPROXIMATIONS
	4.1 Related Rates
	4.2 Rolle's Theorem & Mean Value Theorem
	4.3 Maximum and Minimum Function Values
	4.4 Applications Involving an Absolute Extremum on a Closed Interval
	4.5 Increasing and Decreasing Functions and the First Derivative Test
	4.6 Concavity and Points of Inflection and the Second Derivative Test
	4.7 Summary of Sketching Graph of Functions
	4.8 Additional Applications of Absolute Extrema
		Week 9-13	• Relate implicit differentiation to solving related rates problems.
			• Expose students to mathematical proofs in establishing results.
			• Illustrate and distinguish the difference between local and absolute extrema.
			• Expose students to different applications of relative and absolute extrema.
			• Discuss important concepts in analyzing the behavior of functions.
			• Present a comprehensive view of curve sketching using various concepts studied.
			• *Pre-discussion exercises, instruction add-ons and practice exercises may be taken from the following sites*
			  • analyzemath.com/calculus
			  • archives.math.utk.edu
			  • tutorial.math.lamar.edu

	FINAL EXAMINATION	(3 hrs)	

References

Anton, H. (2002) *Calculus* (7th ed.) New York: Wiley

Edwards, C.H. and Penney, D.E. (2008) *Calculus: Early Transcendentals* (7th ed.) Upper Saddle River, NJ: Pearson/Prentice Hall.

Larson, R.E, Hostetler, R. & Edwards, B.H. (2008) *Essential Calculus: Early Transcendental Functions*. Boston: Houghton Mifflin

Leithold, L. (2002) *The Calculus 7* (Low Price Edition) Addison-Wesley

Simmons, G.F. (1996) *Calculus with Analytic Geometry* (2nd ed.) New York: McGraw-Hill

Smith, Robert T., Minton, Roland B. (2012), *Calculus* , New York : McGraw Hill

Tan, Soo T. (2012) *Applied Calculus for the Managerial, Life, and Social Sciences : A Brief Approach*, Australia : Brooks/Cole Cengage Learning

Vargerg, D.E., Purcell, E.J. & Rigdon, S.E. (2007) *Calculus* (9th ed) Upper Saddle River, N.J.:Pearson Education International

Online Resources

Free Calculus Tutorials and Problems Accessed October 11, 2012 from http://analyzemath.com/calculus/
Visual Calculus Accessed October 11, 2012 from http://archives.math.utk.edu/visual.calculus
tutorial.math.lamar.edu
Dawkins, P. (2012) *Paul's Online Math Notes* Accessed October 11, 2012 from http://tutorial.math.lamar.edu

Class Policies

1. The required minimum number of quizzes for a 3-unit course is 3, and 4 for 4-unit course. No part of the final exam may be considered as one quiz.
2. Cancellation of the lowest quiz is not allowed even if the number of quizzes exceeds the required minimum number of quizzes.
3. As a general policy, no special or make-up tests for missed exams other than the final examination will be given. However, a faculty member may give special exams for
   A. approved absences (where the student concerned officially represented the University at some function or activity).
   B. absences due to serious illness which require hospitalization, death in the family and other reasons which the faculty member deems meritorious.
4. If a student missed two (2) examinations, then he/she will be required to take a make up for the second missed examination.
5. If the student has no valid reason for missing an exam (for example, the student was not prepared to take the exam) then the student receives 0% for the missed quiz.
6. Students who get at least 89% in every quiz are exempted from taking the final examination. Their final grade will be based on the average of their quizzes and other pre-final course requirements. The final grade of exempted students who opt to take the final examination will be based on the prescribed computation of final grades inclusive of a final examination. Students who missed and/or took any special/make-up quiz will not be eligible for exemption.
7. Learning outputs are required and not optional to pass the course.
8. Mobile phones and other forms of communication devices should be on silent mode or turned off during class.
9. Students are expected to be attentive and exhibit the behavior of a mature and responsible individual during class. They are also expected to come to class on time and prepared.
10. Sleeping, bringing in food and drinks, and wearing a cap and sunglasses in class are not allowed.
11. Students who wish to go to the washroom must politely ask permission and, if given such, they should be back in class within 5 minutes. Only one student at a time may be allowed to leave the classroom for this purpose.
12. Students who are absent from the class for more than 5 meetings will get a final grade of 0.0 in the course.
13. Only students who are officially enrolled in the course are allowed to attend the class meetings.

Approved by:

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Chair, Department of Mathematics

April, 2014