



# Lahore University of Management Sciences

## MATH 101 – Calculus I

Spring 2017-2018

Instructor	Ali Ashher Zaidi ; Tanveer Iqbal ; Hira Nadeem
Room No.	9-151 ; 9-139 ; 9-117A
Office Hours	TBA
Email	<a href="mailto:ali.zaidi@lums.edu.pk">ali.zaidi@lums.edu.pk</a> ; <a href="mailto:tanveer.iqbal@lums.edu.pk">tanveer.iqbal@lums.edu.pk</a> ; <a href="mailto:hira.nadeem@lums.edu.pk">hira.nadeem@lums.edu.pk</a>
Telephone	8017 ; 8294 ; 8935
Secretary/TA	Noreen Sohail & Shazia Zafar /
TA Office Hours	TBA
Course URL (if any)	Lms.lums.edu.pk login through ID and password

Course Basics				
Credit Hours	3			
Lecture(s)	Nbr of Lec(s) Per Week		Duration	75min
Recitation/Lab (per week)	Nbr of Lec(s) Per Week		Duration	
Tutorial (per week)	Nbr of Lec(s) Per Week		Duration	

Course Distribution	
Core	
Elective	
Open for Student Category	All students
Close for Student Category	None

COURSE DESCRIPTION	
This is the first course of a two semester course sequence. This course covers limits, continuity, differentiation and its applications, integrals and techniques of integration, applications of integrals, early transcendental functions.	
COURSE PREREQUISITE(S)	
	Calculus-I (Math-101)
COURSE OBJECTIVES	
<ul style="list-style-type: none"> <li>•</li> <li>•</li> <li>•</li> </ul>	<p>The main objective is for students to learn the differential and integral calculus of a function of a single variable. Students should be able to apply single variable calculus to a variety of applications such as related rates, numerical approximation, and optimization.</p> <p>Students should acquire a basic conceptual understanding of limit, continuity, derivative, and integral</p>

Learning Outcomes	
<ul style="list-style-type: none"> <li>•</li> <li>•</li> </ul>	<p>Prove a limit formally</p> <p>Calculate a limit informally</p> <p>Understand when the Intermediate Value Theorem can be applied and do so when appropriate</p> <p>Understand when the Extreme Value Theorem can be applied and do so when appropriate</p>

Students should be able to



## Lahore University of Management Sciences

	Understand derivatives as a rate of change Find local extrema using derivatives Find global extrema Understand Riemann integrals as a limit of Riemann sums Understand derivatives as limits Use Riemann sums to approximate definite integrals Apply integration and differentiation techniques covered in class Calculate derivatives of common functions Calculate derivatives of inverses of functions Find equations of tangent lines Make linear approximations Determine continuity or discontinuity of a function at a point Understand when the Mean Value Theorem can be applied and do so when appropriate Apply the Fundamental Theorem of Calculus Evaluate improper integrals
--	---

### Grading Breakup and Policy

Quizzes (5 best out of 6) 15%  
 Homework (30 out of 30) 10%  
 Midterm 35%  
 Final 40%

### Examination Detail

Midterm Exam	Yes/No: Yes Combine/Separate: Combine Duration: 75min Preferred Date: Exam Specifications: No notes/No books/No calculators
Final Exam	Yes/No: Yes Combine/Separate: Combine Duration: 180min Exam Specifications: No notes/No books/No calculators

### COURSE OVERVIEW

Week/ Lecture/ Module	Topics	Recommended Readings	Objectives/ Application
1	Review of functions, Introduction to limits	Strang 1.1-1.7 T&F 1.1,1.2,1.3, 1.4	Limit
2	Limits and continuity	Strang 2.6-2.7 T&F 1.5	Limit, continuity
3	Derivatives, Derivatives of polynomials	Strang 2.1-2.2 T&F 2.1,2.2,2.3	Derivatives
4	Slopes and tangent lines	Strang 2.3 T&F 1.6	Derivatives
5	Differentiation of trig functions	Strang 2.4 T&F 2.4	Derivatives
6	Solution of $y'' + k^2 y = 0$	Course notes	Application of derivatives
7	Product and quotient rules	Strang 2.5 T&F 2.2	Derivatives
8	Chain rule	Strang 4.1 T&F 2.5	Derivatives
9	Implicit differentiation and related rates	Strang 4.2 T&F 2.6,2.7	Application of derivatives
10	Linear approximation	Strang 3.1 T&F 3.7	Application of derivatives



## Lahore University of Management Sciences

11	Inverse functions and their derivatives	Strang 4.3-4.4 T&F 6.1	Derivatives
12	Extrema	Strang 3.2-3.3 T&F 3.1, 3.3, 3.6	Application of derivatives
13	Mean Value Theorem	Strang 3.8 T&F 3.2	Application of derivatives
14	L'Hopital's rule	Strang 3.8 T&F 6.6	Application of derivatives
15	In definite integrals	Strang 5.4 T&F 4.1, 4.3	Integrals
16	Riemann sums and the definite integral	Strang 5.1-5.3, 5.5-5.6 T&F 4.5	Integrals
17	Exponential function and its derivative	Strang 6.1-6.4, T&F 6.1, 6.2, 6.3, 6.4, 6.5	Derivatives
18	Solution of $y'=ky$	Course notes T&F 4.2	Application of derivatives
19	Solution of $ay''+by'+cy=0$	Course notes	Application of derivatives
20	Fundament theorem of calculus	Strang 5.4, 5.7 T&F 4.7	Derivatives and Integrals
21	Integrals of elementary functions	Strang 5.4, 5.6, 5.8 T&F 7.1	Integrals
22	Integration by parts	Strang 7.1 T&F 7.2	Integrals
23	Trigonometric integrals	Strang 7.2 T&F 7.4	Integrals
24	Integration by trigonometric substitution	Strang 7.3 T&F 7.4	Integrals
25	Integration by partial fractions	Strang 7.4 T&F 7.3	Integrals
26	Improper integrals	Strang 7.5 T&F 7.6	Integrals

\* (T & F stands for Thomas and Finney)

### Textbook(s)/Supplementary Readings

**Text Book:** Calculus and Analytic Geometry by Thomas and Finney

**Reference:** Calculus by Gilbert Strang, <http://ocw.mit.edu/resources/res-18-001-calculus-online-textbook-spring-2005/textbook/>