



KING SAUD UNIVERSITY
DEANSHIP of common firSt yEAR
BASIC SCIENCES DEPARTMENT

SYLLABUS AND CONTENTS OF MATH 101 (1446 H)

Course Name: Differential Calculus

Credit Hours: 3 hours

Course Number: Math 101

Actual Hours: 5 hours

Prerequisite: ---

Semester: Second Semester

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Textbook:

Differential Calculus, Fourth Edition, 2019

Authors:

Ibraheem Aloyan, Nasser Bin Turki, Tahsin Ghazal, Obaid Al-Gahtani and Khaled Khashan

References:

- Swokowski, E, W; Olinick, M; Penece, D. Calculus, Sixth Edition, PWS Publishing Company, 1994.
- Larson, R & Edwards, R. **Calculus**, Tenth Edition, Cengage Learning, 2014.
- Anton, H; Bivens, I & Davis, S. **Calculus Early Transcendentals**, Ninth Edition, Wily & Sons, 2009.

CONTENTS:

Functions: set of Numbers and Inequalities, Functions: Basic Definitions and Examples, Properties of functions, and their combination, Inverse functions, Trigonometric functions, Inverse Trigonometric functions.

Limits and Continuity: Definition of Limit, Limits Laws, Limits Involving Infinity, Continuity of Functions.

Differentiation: The Derivative and the Tangent Line Problem, Differentiation Rules, Derivatives of Trigonometric Functions, The Chain Rule, Implicit Differentiation, Higher Order Derivatives, The Derivative of Inverse Functions.

Applications of Differentiation: Extrema of Functions, The Mean Value Theorem, Increasing and Decreasing Functions, Concavity, Curve Sketching, Optimization Problems, Related Rates.

Logarithmic and Exponential Functions: Integration, The Natural Logarithmic Function, The Natural Exponential Function, General Exponential and Logarithmic Functions.

GOALS

In this course the student will:

- Define functions and their types.
- Define and apply the properties of limits of functions.
- State the definition of continuity and determine where a function is continuous or discontinuous.
- Find the derivative of an algebraic function by using the definition of a derivative.
- Apply differentiation rules to find the derivative of algebraic, trigonometric, exponential, and logarithmic functions and their inverses.
- Apply differentiation rules to find the derivative of the sum, product, quotient, inverse, and composite (chain rule) of elementary functions.
- Find the derivative of an implicitly defined function.
- Find the higher order derivatives of algebraic, trigonometric, exponential, and logarithmic functions.
- State and prove the Mean Value Theorem for derivatives and apply it algebraically and graphically.
- Use the derivative to find critical numbers, increasing intervals, decreasing intervals, local extrema, absolute extrema, concavity intervals and inflection points.
- Apply the derivative to solve problems, including tangent lines to a curve, curve sketching, velocity, and acceleration.

Evaluation:

The evaluation of the students will be continuous during the course and depends on the following:

Mid Term Exam	25
Activities	10
Two Home works(Paper)	4+4
Online Home works	7
Final Exam	50

تعليمات مهمة:

١. الخطة التي بين أيديكم أنبأنا الطلاب هي خطة مختصرة تتضمن الأشياء المهمة في المقرر. الخطة التفصيلية وكل ما يتعلق بالمقرر موجود على موقع السنة الأولى المشتركة على الرابط:

<https://cfy.ksu.edu.sa/ar/node/1196>

٢. يحتسب الغياب منذ اليوم الأول من الفصل الدراسي إلى آخر يوم قبل الاختبارات النهائية.

٣. في حال تأخر الطالب عن المحاضرة عشر دقائق يعتبر غائبا، وفي حالة حضوره خلال العشر دقائق الأولى يسجل متأخرا.

٤. يحرم الطالب من المقرر إذا تجاوزت غيابه ٢٥% من ساعات الحضور.

Course Schedule and Contents:

Chapter	Weeks	Section	Lecture "Teacher"	Lecture "Students"	For Students
Chapter One	1-4	1.1 Sets of Numbers and Inequalities	Example: 1.1.2, 1.1.4 (except d) Related Problem: 1 Exercise: (18)	Related Problem: 3 (except c) Exercise: (7)	1,3,5,6,8,16,19,21,23
		1.2 Functions	Example: 1.2.3, 1.2.5, 1.2.8 Exercise: (60,66)	Related Problem: (2) Exercise: (59,64)	9,10,12,14,17,19,20,23,31,32,48,54,57,58,63,67
		1.3 Inverse Functions	Example: 1.3.1, 1.3.2 {a, b}, 1.3.4 Related Problem: (2 {b}, 3) Exercise: (30) Remark page 31	Related Problem: (2 {a, c}, 5) Exercise: (1,2,3,4,5)	8,9,11,13,15,16,29,33,38,41,42
		1.4 Trigonometric Functions and Their Inverses	Example: (1.4.4, 1.4.5, 1.4.7, 1.4.8, 1.4.9, and 1.4.10) Related Problem: (1,2,3,9 {b}) Exercise: (41)	Related Problem: (4,5,7) Exercise: (38, 53 {b})	2,4,5,8,9,12,14,16,17,18,20,21,28,29,37,40,42,44,48,49,50,52
Chapter Two Limits and Continuity	5-8	2.1 Definition of Limit	Example: (2.1.1, 2.1.2) Exercise (from 12 to 17)	Exercise (9 from 18 to 26)	2,3,7,8,10
		2.2 Limits Laws	Example: (2.2.3, 2.2.4, 2.2.5, 2.2.6" except {d}", 2.2.7 {a}, 2.2.9, 2.2.11, 2.2.12)	Related Problem (2 {a, c}, 4 (any two points), 6 {c}).	1,2,3,7,11,13,19,21,26,29,30,31,35,40,41,49,51,53,55,63,64,66,71,74

			Related Problem: (6 {d, e, f}) Exercise (73) Remark page 90		
		2.3 Limits Involving Infinity	Example: (2.3.1, 2.3.5, 2.3.8, 2.3.9) Related Problem: (3(g)) Exercise (from 1 to 9, 22 and 28)	Related Problem: (4 (any two points), 3 {a}) Exercise (from 10 to 18)	19,20,21,24,25,32,35,36,37,38,44,45,47,49
		2.4 Continuity of Functions	Example: (2.4.1, 2.4.2, 2.4.4, 2.4.6, 2.4.8, 2.4.11) Exercise (28)	Related Problem: (3 {b, c}) Exercise (2,4,9,27,59)	1,3,5,7,8,12,13,18,29,30,32,34,40,58,60
Chapter Three Differentiation	9-12	3.1 The Derivative and the Tangent Line Problem	Example: (3.1.3, 3.1.7, 3.1.9) Exercise: (8,30) Related Problem: (1,8)	Related Problem: (9) Exercise: (2, 31)	Ex.3.1.6, RP6 6,10,13,15,21
		3.2 Differentiation Rules	Use the Remark page 166 (give an example) Example: (3.2.1 {a, b, c}, 3.2.2 {b, c}, 3.2.3 {b}, 3.2.5) Related Problem: (6) Exercise: (44)	Related Problem: (2 {b}, 3 {b}, 5) Exercise: (25)	1,4,5,8,12,14,16,17,18,19,23,24,26,28,37,38,40
		3.3 Derivatives of Trigonometric functions	Example: (3.3.1, 3.3.2, 3.3.5) Related Problem: (3)	Related Problem: (2, 5) Exercise: (14)	1,3,5,7,10,11,13,16,19,20,21,23,27
		3.4 The Chain rule	Example: (3.4.2, 3.4.3, 3.4.6) Exercise: (25) Related Problem: (8)	Related Problem: (2 {a}, 3 {b}) Exercise: (13, 33)	2,5,6,8,9,11,12,15,16,20,21,26,27,29,30,34,38,39,40,47
		3.5 Implicit Differentiation	Example: (3.5.1) Related Problem: (2)	Related Problem (1 {b}) Exercise: (15)	1,2,3,4,5,8,12,13,14,17,19,20,23,26

		3.6 Higher Order Derivatives	Example: (3.6.1, 3.6.7) Related Problem: (2,3)	Exercise: (39)	1,4,6,7,10,12,13,14,16,18,19,22,23,26,27,29,32,34,35,37,38,43
		3.7 The Derivative of Inverse Functions	Related Problem (2) Exercise: (5)	Exercise: (3,7,13)	6,8,11,14,15,16,17,23
Chapter Four Applications of Differentiation	12-14	4.1 Extrema of Functions	Example: (4.1.4 except {g}, 4.1.5) Related Problem: (1) Exercise: (24)	Related Problem: (2 {b}) Exercise: (15)	5,6,8,10,16,19,23
		4.2 The Mean Value Theorem	Example: (4.2.1, 4.2.4) Exercise: (1,2)	Related Problem: (1, 2) Exercise: (14)	6,7,11,18,21,24,26
		4.3 Increasing and Decreasing Functions	Example: (4.3.3, 4.3.4) Exercise: (1,3)	Related Problem: (2, 3 {a}) Exercise: (2,4)	7,11,13,15,26,37,38
		4.4 Concavity	Example: (4.4.1, 4.4.5, 4.4.6) Exercise: (from 5 to 9, 47)	Related Problem: (1 {a}, 2 {b}) Exercise: (10,11)	12,25,28,36,48
		4.5 Curve sketching	Exercise: (3,9)	Exercise: (4, 7)	1,2,8