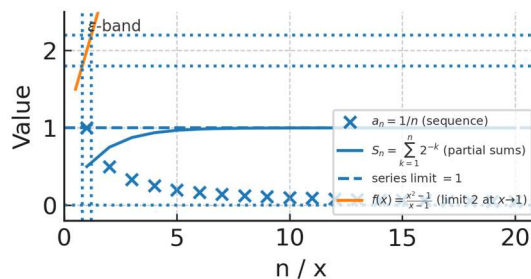


Department of Mathematics

REAL ANALYSIS I

MATH 341 – TERM 251



Instructor Info

Name: Ibrahim O. Sarumi, PhD

Office Hrs: UT 11:10 AM – 12:40 PM

Location: Building 5, Room 415

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Course Info

Prerequisite: Math 210 or ICS 253

Days: UTR

Time: 10:00 AM – 10:50 AM

Location: Building 59, Room 2023

Course Description

The real number system. Continuity and limits. Uniform continuity. Differentiability of functions of one variable. Definition, existence and properties of the Riemann integral. The fundamental theorem of calculus. Sequences and series of real numbers.

Textbook

Introduction to Real Analysis by Robert G. Bartle and Donald R. Sherbert, 4th Ed, Wiley (2011).

Course Learning Outcomes

Upon completion of this course, students should be able to:

- Use the fundamental properties of real numbers.
- Write the proofs of basic theorems of limits of function of one variable and use these theorems.
- Prove and apply elementary theorems of continuity of functions of one variable.
- Prove and use basic theorems of differential calculus of function of one variable.
- Prove and apply basic theorems of integral calculus of function of one variable.
- Determine convergence of series of real numbers and series of functions.
- Apply the fundamental theorem of calculus of function of one variable.

Grading Scheme

40%: Two Major Exams (20% each)

15%: Homework

10%: Project-Presentation

35%: Final Exam

Final grade scale:

A+ = 90-100; A = 80-90; B+ = 75-80; B = 70-75; C+ = 65-70; C = 55-65; D+ = 50-55; D = 45-50; F < 45.

Attendance

1. Students must adhere to the attendance policy of KFUPM.
2. A DN grade will be given to any student who accumulates 9 unexcused absences or 15 unexcused and excused absences.
3. A DN grade will be given to the eligible student after being warned twice.

Academic Integrity

All KFUPM ethics policies apply in this course.

Graduate Attributes

See: <https://math.kfupm.edu.sa/bsinmathematics/graduate-attributes>

Course Schedule

Week & Dates	Topics / Activities	Homework
Week 1 (Aug. 24–28)	2.1 Algebraic & Order Properties of \mathbb{R} ; 2.2 Absolute Value & the Real Line	2.1: 7, 8, 9, 10, 13, 17 (pp. 29–30); 2.2: 2, 4, 5, 7, 8, 12, 15 (p. 34)
Week 2 (Aug. 31–Sep. 4)	2.3 Completeness Property of \mathbb{R} ; 2.4 Applications of the Supremum Property	2.3: 1, 2, 3, 4, 5, 6, 9, 10 (p. 38); 2.4: 1, 2, 4, 7, 12, 14, 18 (pp. 43–44)
Week 3 (Sep. 7–11)	3.1 Sequences & Their Limits; 3.2 Limit Theorems	3.1: 1, 4, 5(a,c), 7, 8, 9, 10 (pp. 59–60); 3.2: 1, 6, 7, 9, 12, 16, 17, 19, 20 (pp. 67–68)
Week 4 (Sep. 14–18)	3.3 Monotone Sequences; 3.4 Subsequences & Bolzano–Weierstrass	3.3: 1, 2, 6, 7, 9, 10, 11, 12 (pp. 74–75); 3.4: 1, 2, 6, 7, 10, 11, 12, 14 (p. 80)
National Day (Sept. 23)	No Classes	—
Week 5 (Sep. 21–25)	3.5 Cauchy Criterion; 3.6 Properly Divergent Sequences	3.5: 1, 2, 4, 5, 7, 9, 10, 12 (p. 86); 3.6: 1, 2, 4, 7, 9, 10 (p. 88)
Week 6 (Sep. 28–Oct. 2)	4.1 Limits of Functions; 4.2 Limit Theorems — Major Exam I (2.1–3.6)	4.1: 2, 3, 4, 6, 11, 12, 14 (p. 104); 4.2: 1(a,b), 2, 4, 8, 11, 14 (pp. 110–111)
Major Exam 1: Week 6, Material: 2.1 – 3.6		
Week 7 (Oct. 5–9)	5.1 Continuous Functions; 5.2 Combinations of Continuous Functions	5.1: 1, 2, 7, 8, 11, 12, 13, 15 (pp. 124–125); 5.2: 2, 4, 6, 7, 8, 9, 10, 15 (pp. 128–129)
Week 8 (Oct. 12–16)	5.3 Continuous Functions on Intervals; 5.4 Uniform Continuity	5.3: 1, 2, 4, 8, 11, 13, 14, 17 (pp. 135–136); 5.4: 1, 2, 4, 6, 9, 10, 12 (pp. 144–145)
Week 9 (Oct. 19–23)	5.6 Monotone & Inverse Functions; 6.1 The Derivatives	6.2: 1, 6, 7, 8, 10, 13, 14, 15, 19 (pp. 175–176); 6.3: 1, 3, 5, 7, 8, 10 (pp. 182–183)

Midterm Break (Oct. 26–30)	No Classes	
Week 10 (Nov. 2–6)	6.2 Mean Value Theorem; 6.3 L'Hospital's Rules	5.6: 1, 2, 3, 4, 5, 10 (pp. 155–156); 6.1: 1, 2, 4, 7, 9, 10 (pp. 166–167)
Week 11 (Nov. 9–13)	6.4 Taylor's Theorem; 7.1 Riemann Integral — Major Exam II (4.1–6.2)	6.4: 1, 4, 7, 11, 16, 18 (pp. 191–192); 7.1: 1, 3, 13, 14, 16, 17 (pp. 201–202)
Major Exam 2: Week 11, Material: 4.1 – 6.2		
Week 12 (Nov. 16–20)	7.2 Riemann Integrable Functions	7.2: 2, 8, 9, 10, 16, 17, 20 (pp. 208–210)
Week 13 (Nov. 23–27)	7.3 Fundamental Theorem of Calculus	7.3: 5, 6, 8, 10, 13, 14, 15, 17, 18, 21 (pp. 217–219)
Week 14 (Nov. 30–Dec. 4)	9.1 Absolute Convergence; 9.2 Tests for Absolute Convergence	9.1: 1, 6, 7, 8, 9, 10, 11, 13 (pp. 256–257); 9.2: 1, 3, 6, 8, 10, 11, 15, 17, 18 (pp. 262–263)
Week 15 (Dec. 7 – Dec. 11)	9.3 Tests for Nonabsolute Convergence; 9.4 Series of Functions	9.3: 1, 2, 7, 8, 12, 14, 15 (pp. 265–266); 9.4: 1, 2, 6, 9, 11, 12, 16, 17, 18 (pp. 272–273)
Week 16 (Dec. 14)	8.1 Pointwise and Uniform Convergence	
Final Exam Material: Comprehensive		