

Analysis- II (Real Functions)

1st Week

Limits of functions (ϵ - δ approach), sequential criterion for limits, divergence criteria.
[1] Chapter 4, Section 4.1

2nd Week

Limit theorems, one sided limits.
[1]Chapter 4, Section 4.2, Section 4.3 (4.3.1 to 4.3.4)

3rd Week

Infinite limits & limits at infinity.
[1]Chapter 4, Section 4.3 (4.3.5 to 4.3.16)

4th Week

Continuous functions, sequential criterion for continuity & discontinuity.
[1] Chapter 5, Section 5.1

5th Week

Algebra of continuous functions.
[1]Chapter 5, Section 5.2

6th Week

Continuous functions on an interval, intermediate value theorem, location of roots theorem, preservation of intervals theorem.
[2]Art.18.1, 18.2, 18.3, 18.5, 18.6

7th Week

Uniform continuity, non-uniform continuity criteria, uniform continuity theorem.
[1]Chapter 5, Section 5.4 (5.4.1 to 5.4.3)

8th Week

Differentiability of a function at a point & in an interval, Carathéodory's theorem, algebra of differentiable functions.

[1]Chapter 6, Section 6.1 (6.1.1 to 6.1.7)

9th& 10th Week

Relative extrema, interior extremum theorem. Rolle's theorem, Mean value theorem, intermediate value property of derivatives - Darboux's theorem. Applications of mean value theorem to inequalities & approximation of polynomials Taylor's theorem to inequalities.

[1] Chapter 6, Section 6.2 (6.2.1 to 6.2.7, 6.2.11, 6.2.12)

11th&12th Week

Cauchy's mean value theorem. Taylor's theorem with Lagrange's form of remainder, Taylor's theorem with Cauchy's form of remainder, application of Taylor's theorem to convex functions, relative extrema. Taylor's series & Maclaurin's series expansions of exponential & trigonometric functions, $\ln(1+x)$, $\frac{1}{(ax+b)}$ & $(1+x)^n$.

[1] Chapter 6, Section 6.3 (6.3.2) Section 6.4 (6.4.1 to 6.4.6)

REFERENCES:

1. **R. G. Bartle & D.R. Sherbert**, Introduction to Real Analysis, John Wiley & Sons (2003)
2. **K. A. Ross**, Elementary Analysis: The Theory of Calculus, Springer (2004).

Suggestive Readings

1. **A. Mattuck**, Introduction to Analysis, Prentice Hall (1999).
2. **S.R.Ghorpade & B.V.Limaye**, A Course in Calculus and Real Analysis – Springer (2006).