

MATH 401 – Spring 2009
Review sheet for the Final Exam

Topics to be known

Chapter 2: The Continuum Property

- The continuum property
- Supremum and infimum
- Maximum and minimum
- Manipulation with sup and inf

Chapter 3: Natural Numbers

- Archimedean property
- The principle of mathematical induction

Chapter 4: Convergent sequences

- Sequences
- Definition of convergence
- Cauchy criterion
- Monotone sequences
- The sandwich theorem
- Properties of convergent sequences
- Divergent sequences

Chapter 5: Subsequences

- Lim sup and lim inf
- Bolzano-Weierstrass Theorem
- Cauchy sequences

Chapter 6: Series

- Series of positive terms
- Properties of series
- Geometric, harmonic, collapsing, alternating series, and p -series.
- *Absolute convergence*
- *Conditional convergence*

Chapter 7: Functions

- Elementary functions: polynomials and rational functions, cosine, ...
- Bounded functions
- Inverse functions

Chapter 8: Limit of Functions

- Limits of functions
- One-sided limits
- Properties of limits
- Continuity at a point
- Sequential criterion for limits (theorem 8.9)
- Properties of limits (proposition 8.12)
- Sandwich theorem for limits (proposition 8.14)
- Divergence

Chapter 9: Continuity

- Continuous functions on an interval
- Continuity property on compact intervals (theorem 9.8)
- Extremum values of continuous functions on compact sets (see 9.12)
- The intermediate value theorem

Chapter 10: Differentiation

- The limit definition of the derivative
- Higher derivatives
- One-sided derivatives
- Properties of differentiable functions (theorem 10.9)

Chapter 11: Mean Value Theorems

- Local maxima and minima
- Stationary points
- Rolle's theorem
- The mean value theorem
- Taylor's theorem

Chapter 12: Monotone functions

- Limits of monotone sequences
- Differentiable monotone functions
- Inverse functions
- Convex functions

Chapter 13: Integration

- Riemann sums and the integral
- Differentiation and integration: the fundamental theorem of calculus
- Properties of integrals
- Improper integrals

Chapter 15: Power series

- Interval of convergence
- Radius of convergence
- Taylor series
- Continuity
- Term by term differentiation
- Term by term integration

Additional topic: Point-wise convergence and uniform convergence

- Pointwise convergence for sequences of functions
- Uniform convergence