

Oral Qualifying Exam Syllabus

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Major Topic: Experimental Mathematics

Minor Topic: Graph Theory

1 Experimental Mathematics

1. Computer Algebra
 - Maple
 - Dynamic Programming
 - Symbolic Sums
2. Formal Power Series
 - Differentiation and Division
 - Sequences of Power Series
 - Truncated Power Series
3. Polynomials
 - Polynomials as Power Series
 - Polynomials as Sequences
 - Sums
4. C-Finite Sequences
 - Fibonacci Numbers
 - Recurrences with Constant Coefficients
 - Closure Properties
5. Holonomic Systems and Hypergeometric Series
 - Gosper's Algorithm for Indefinite Hypergeometric Summations
 - Definite Hypergeometric Summations
 - WZ Pairs

2 Graph Theory

1. Matchings: König's Theorem, Hall's Theorem
2. Connectivity: Menger's Theorem, Max Flow - Min Cut Theorem
3. Planarity: Euler's Theorem, Kuratowski's Theorem
4. Extremal Graph Theory: Mantel's Theorem, statement of Turán's Theorem, statement of Szemerédi's Regularity Lemma, Ramsey's Theorem, statement of Hales-Jewett Theorem, definition of Random Graphs
5. Coloring: Brook's Theorem