MA 3513
Overview of new topics for Final Examination

Timeline

	∼2000 BCE	Babylonians solve problems involving quadratic equations.
	200BCE - 200CE	Han dynasty mathematicians develop Gaussian elimination algorithm for solving systems of linear equations.
∗	628	Brahmagupta develops theory of composition of good triples for solving Pell-like equations. Develops algebra, states general form of quadratic equation.
∗	830	Al-Khwarizmi develops algebra in widely-read work, clearly presents quadratic equation via completing the square.
∗	1150	Bhaskara II develops cyclic process for solving Pell-like equations.
	early 1200s	Fibonacci works. Exposits Arabic numerals to wide audience; studies cubic whose solutions are not nested square-roots.
∗	1545	Cardano publishes textbook with the cubic equation (due to del Ferro, Tartaglia from early 1500s), and with the quartic equation.
	1591	Viete trisects angle via algebra, together with related problems.
	1629	Fermat discovers Cartesian plane; does limited amount with it and doesn't publish until much later.
∗	1637	Descarte discovers and develops Cartesian plane and theory of algebraic curves. Describes degree 2 curves as conic sections.
	1657	Fermat rediscovers cyclic process.
	late 1600s	Newton works. Gives equation for n-secting angles.
	1707	de Moivre gives formula for solution to angle n-section
	1768	Lagrange proves that cyclic process always terminates with solution to Pell's equation.
	1786	Bring reduces solving quintic to solving $x^5 - x = A$.
∗	1799	Ruffini shows there is no quintic equation. His proof has holes.
	1810	Gauss develops linear elimination into a practical method.
	1820	Abels proves rigorously that there is no quintic equation.
∗	1831	Galois develops modern field-theoretic proof that there is no quintic equation.
	mid-1900s	Mary Ellen Rudin develops many counterexamples to conjectures in topology.

Main ideas

1. Pell-like equations
   (a) good triples
   (b) composition
   (c) cyclic process
2. Algebra
   (a) the idea of algebra
   (b) quadratic equation
   (c) polynomials and polynomial equations
   (d) field theory approach to constructible numbers
3. Analytic geometry
   (a) usefulness of the Cartesian plane
4. Shellings and $V - E + F$