

HISTORY (MATH 4820): REVIEW SHEET

I. Math topics.

- (a) the solution of cubic and quartic equations (including extraction of roots, roots of unity and De Moivre's Formula)
- (b) Higher order polynomial equations: Bring radicals, the work of Lagrange, Ruffini, Abel and Galois.
- (c) Viète's Formulas
- (d) Klein's Erlangen Program.
- (e) Bézout's Theorem
- (f) constructions of the projective plane, change of coordinates in the projective plane
- (g) homogenization of curves
- (h) projective transformations
- (i) All irreducible conics are projectively equivalent in \mathbb{CP}^2 .
- (j) intersection multiplicity
- (k) Hilbert's 1st problem: the continuum hypothesis. (Aleph's and beth's, GCH, the work of Gödel and Cohen.)
- (l) Hilbert's 2nd problem: the consistency of arithmetic. (The work of Gödel and Gentzen.)
- (m) Hilbert's 3rd problem: equidecomposability of polyhedra. (The Wallace-Bolyai-Gerwien Theorem, Dehn's solution, Dehn invariant.)
- (n) Hilbert's 7th problem: transcendentalities of α^β .
- (o) Hilbert's 10th problem: algorithmically determine if a Diophantine equation with integer coefficients has integer roots.
- (p) What is the statement of Ramsey's Theorem?

II. History topics. (Phrased as questions.)

- (a) Who are the key figures in the discovery of the cubic formula?
- (b) Who first discovered how to solve quartic equations?
- (c) What are Bring radicals, and why are they interesting?
- (d) Who are the key figures in the discovery that the general quintic is not solvable by radicals?
- (e) What was Hilbert's 1st problem, and how was it resolved? Who were the key figures?
- (f) What was Hilbert's 2nd problem, and how was it resolved? Who were the key figures?
- (g) What was Hilbert's 3rd problem, and how was it resolved? Who were the key figures?
- (h) What was Hilbert's 7th problem, and how was it resolved? Who were the key figures?

- (i) What was Hilbert's 10th problem, and how was it resolved? Who were the key figures?
- (j) Who showed that volume together with Dehn invariant are a complete set of invariants for the equidecomposability of polyhedra?
- (k) Name three mathematical results or concepts named after someone other than the originator

General advice on preparing for a math test.

Be prepared to demonstrate understanding in the following ways.

- (i) Know the definitions of new concepts, and the meanings of the definitions.
- (ii) Know the statements and meanings of the major theorems.
- (iii) Know examples/counterexamples. (The purpose of an example is to illustrate the extent of a definition or theorem. The purpose of a counterexample is to indicate the limits of a definition or theorem.)
- (iv) Know how to perform the different kinds of calculations discussed in class.
- (v) Be prepared to prove elementary statements. (Understanding the proofs done in class is the best preparation for this.)
- (vi) Know how to correct mistakes made on old HW.