

## HISTORY (MATH 4820): REVIEW SHEET

### I. Math topics.

- (a) Pell's Equation
- (b) Brahmagupta's Identity (with application to Pell's Equation)
- (c) continued fractions (with application to Pell's Equation)
- (d) method of exhaustion to find areas and volumes
- (e) the solution of cubic and quartic equations (including extraction of roots, roots of unity and De Moivre's Formula)
- (f) Viete's Formulas
- (g) Bezout's Theorem
- (h) intersection multiplicity
- (i) constructions of the projective plane
- (j) projective transformations
- (k) Pappus's Theorem and Pascal's Hexagrammum Mysticum Theorem
- (l) the Poincare model of the hyperbolic plane
- (m) cross ratio
- (n) circular inversion and reflection in the Poincare model
- (o) equidecomposability and the Wallace-Bolyai-Gerwien Theorem
- (p) Hilbert's 3rd problem and Dehn's solution

### 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) Why is Desargues remembered?
- (f) Why is Bolyai remembered?
- (g) Why is Lobachevsky remembered?
- (h) Who discovered the Poincare model of the hyperbolic plane?
- (h) Who showed that volume together with Dehn invariant are a complete set of invariants for the equidecomposability of polyhedra?
- (i) Can you 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.