Math 2^8: The Theory of Error-Correcting Codes
pseudo-syllabus

0. Introduction: why coding theory?

1. Linear codes: general definitions, properties, and problems

2. The geometric approach: points in near-general position in finite projective space [Goppa]

3. Weight enumerators; the MacWilliams identity and variations

4. Construction and properties of special codes and families of codes

5. As time and students' preparation permit: further MacWilliams variations; the "linear programming" bounds; Geometry continued: curves with many points and very good codes over $\mathbf{F}_{q^2}$; nonlinear codes over $\mathbf{P}^1(\mathbf{F}_{q^2})$ using the same curves; other topics

Texts Much of the material will be taken from *The Theory of Error-Correcting Codes* by Macwilliams and Sloane. Goppa's *Geometry and Codes* covers the remaining topics. These two books, as well as *Introduction to Coding Theory and Algebraic Geometry* by van Lint and van der Geer, are in the Birkhoff (3rd floor math) library, and can be checked out of the Cabot (Science Center) library.

Course webpage `http://www.math.harvard.edu/~elkies/M256.13/`

Office Hours By appointment — e-mail me at `elkies@math.harvard.edu` to set up a meeting time (or to ask about the course directly).

Grading If you're taking Math 256 for a grade (i.e. are not a post-Qual math graduate student exercising your EXC option), tell me so we can work out an evaluation and grading procedure. In the past this has meant a written final project.

Note There will be no class Thursday the 12th of September. I'll make up this class, and any that I might have to miss later in the term, during Reading Period.