SPRING 2004, MATH 216B : INTRODUCTION TO ALGEBRAIC GEOMETRY

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This course will be an introduction to algebraic geometry using the language of toric varieties. Toric varieties are varieties defined by the combinatorial data of a convex polytope. They provide an important class of examples in algebraic geometry, primarily because of the dictionary developed between algebro-geometric invariants and combinatorial ones. A basic example is that the dimension of the variety is given by the dimension of the convex polytope. The bulk of the course will be introducing this dictionary, defining the terms on both sides. No familiarity with algebraic geometry will be assumed, though those who have not played with affine varieties before will have to do more work. My bias will always be algebraic, combinatorial, and computational.

References

[1] William Fulton. *Introduction to toric varieties*, volume 131 of *Annals of Mathematics Studies*. Princeton University Press, Princeton, NJ, 1993. The William H. Roever Lectures in Geometry.

[2] Günter Ewald. *Combinatorial convexity and algebraic geometry*, volume 168 of *Graduate Texts in Mathematics*. Springer-Verlag, New York, 1996.

[3] Günter M. Ziegler. *Lectures on polytopes*, volume 152 of *Graduate Texts in Mathematics*. Springer-Verlag, New York, 1995.

These should all be on reserve in the library (soon!). We will mostly follow Fulton's book. Ewald provides a gentler introduction to those coming from the combinatorial side, while Ziegler's book is a great reference on polytopes.

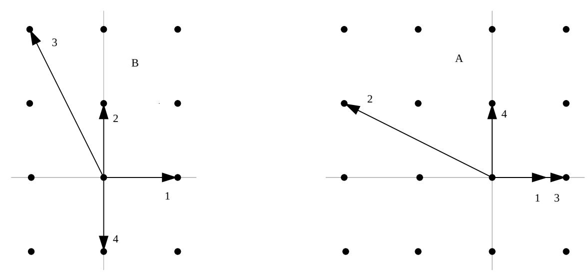

Figure 1. The defining fan and Picard group for the Hirzebruch surface $\mathbb{F}_2$.