Math 319: Algebraic Geometry

Homework # 3: Due Monday, February 9, 2004

READ CHAPTER 2 in our textbook carefully. Have a look at the handout on the Fundamental Theorem of Algebra and make sure you understand what it means about polynomials over the complex numbers.

1. Consider the circle

$$(x + 1)^2 + y^2 = 1.$$ 

Take the point $(0, 0)$ on this circle at the pedal point and find the parametric equations for the pedal of the circle when the pedal point is on the circumference of the circle.

2. Use the method of projecting to parametrize the hyperbola $x^2 - y^2 = 1$ using the point $(-1, 0)$ as your special point and the $y$-axis as the line you project onto. Note that you have found rational functions to represent $x$ and $y$ where $x = \cosh(\theta) = (e^\theta + e^{-\theta})/2$ and $y = \sinh(\theta) = (e^\theta - e^{-\theta})/2$. Can you see how $\theta$ and $t$ are related? Can you try a few values for $t$ in your parametrization and show that they are on the hyperbola? What point on the hyperbola is not on your parametrization?

3. Do page 32 problems 2.4.1, 2.4.2, 2.4.3 (this is no big deal just look at the definitions), 2.4.4, 2.4.5.