# MATH 380A/500A, PROBLEM SET 11

These problems are due during the week of December 2-6, at a time to be chosen by you.

(1) Eisenbud, exercise 13.10.

(2) Unlike the case of the Krull-Akizuki theorem, it is not true that an arbitrary ring between an affine domain and its field of fractions is Noetherian. For example, take $R = k[x, y]$ for $k$ a field, and $K$ the fraction field of $R$. Let $T$ be the subring of $K$ generated over $R$ and the monomials

$$\{x^a y^b \mid a \geq 0, \pi b + a \geq 0\}.$$

Here, $\pi \approx 3.14159\ldots$ is the ratio of the circumference to the diameter of a circle. Show that $T$ is not Noetherian.

(3) Eisenbud, exercise 13.2.

If $b \in R$, then the elementary symmetric functions in the conjugates of $b$ are the coefficients of the polynomial $\prod_{\sigma \in G}(x - \sigma b)$. You can take this as the definition of the elementary symmetric functions.

(4) Eisenbud, exercise 13.3.

(5) Eisenbud, exercise 15.4.

(6) Eisenbud, exercise 15.5.