Homework 2

All exercises from Artin

due Aug 24

1 Exercise. Express $\cos 15^o$ in terms of square roots, even better if you trisect the 45° angle and construct this cosine therefore.

2 Exercise. Assuming that π is transcendental. Show that it's impossible to construct a square whose area is the same as the area of the unit circle.

3 Exercise. Prove that it is impossible to construct the side length of a cube whose volume is 2.

4 Exercise. Characterize the constructible real numbers in the case that three points are given in the plane to start.

5 Exercise. For which fields F and which primes p does $x^p - x$ have multiple roots?

6 Exercise. Let F be a field of characteristic p. Factor the polynomial $x^p + 1$ in irreducible factors in $F[x]$.

7 Exercise. Let $\alpha_1, \cdots, \alpha_n$ be roots of a polynomial $f \in F[x]$ of degree n in an extension field K. Find the best upper bound that you can for $F(\alpha_1, \cdots, \alpha_n) : F]$.