

Math 112
Assignment 4
Due Fri Mar 14

1. Stewart exercises 5.1-5.8
2. Let $K \subset \mathbb{C}$ be a subfield and let $m \in K[x]$. Recall the notion of *equivalence mod m* where $f \sim g \pmod{m}$ when $m \mid (f - g)$. Prove that $f \sim g \pmod{m}$ if and only if f and g have the same reduced form mod m .
3. Below we find various polynomial expressions $\beta = p(\alpha)$ in given algebraic numbers α . In each case, compute the multiplicative inverse of β as a polynomial expression α by applying the Euclidean algorithm to $\langle m(x), p(x) \rangle$, where $m(x)$ is the minimal polynomial of α over \mathbb{Q} .
 - (a) $\beta = 1 + 2\alpha$, $\alpha = \sqrt{2}$.
 - (b) $\beta = 1 + 2\alpha + 3\alpha^2$, $\alpha = \sqrt[3]{2}$.
 - (c) $\beta = 1 + 2\alpha + 3\alpha^2$, $\alpha = 1 + \sqrt[3]{2}$.