Extra credit project

The total number of points is 10. This project will allow you to improve your score in the course by at most 10 points which will be simply added to the total score. The total score itself will not exceed 100 points.

**Question 1** (2 points). Show that the degree of the extension $[\mathbb{C} : \mathbb{R}]$ is equal to 2.

**Question 2** (2 points). Let $\mathbb{F}_9$ be the field with 9 elements that we constructed in class. This is the same field as in the example 2 in section 4.4 in the book. The elements in $\mathbb{F}_9$ are in one-to-one correspondence with the 9 representatives from $\mathbb{Z}_3 + i\mathbb{Z}_3$. Let $\mathbb{Z}_3$ denote the three elements with no imaginary component. Show carefully that $\mathbb{Z}_3$ is a subfield and that the degree of the extension $[\mathbb{F}_9 : \mathbb{Z}_3]$ is equal to 3.

**Question 3** (2 points). I will read further into section 5.3 in class on Friday. I will state one of the theorems, Theorem 5.3.1, but may not prove it. This problem is to read the proof and write it down here in your own words.

**Question 4** (2 points). Problem 1, parts (1), (2) and (3) only, on page 197 in Herstein.

**Question 5** (2 points). Problem 1 on page 200 in Herstein.