

Math 103B Winter 2006 HW 4

HW Due Friday 2/10/06 in class

All exercise and page numbers refer to Gallian, 6th edition.

0. These exercises are suggestions for extra practice at home or in section and are not to be turned in.

Gallian Chapter 15, #39, 45.

Gallian Chapter 16, #1, 11, 13, 15, 19, 41

1. Gallian Chapter 15, #36, 40, 51.

2. Gallian Chapter 16, #2, 4, 12, 20, 24, 40

Comments and Hints:

15.36. In fact any homomorphism $\phi : \mathbb{Q} \rightarrow \mathbb{Q}$ must be the identity homomorphism. So that's what you should show. (Hint: First show $\phi(1) = 1$, then show $\phi(a) = a$ for all $a \in \mathbb{Z}$, then finally show $\phi(p/q) = p/q$ for all $p, q \in \mathbb{Z}$ with $q \neq 0$.)

15.40. Think about the first isomorphism theorem. What can the kernel of the homomorphism be?

16.20. Think about the roots of the polynomial $h = f - g$.

16.40. Consider the evaluation homomorphism $\mathbb{Q}[x] \rightarrow \mathbb{Q}[\sqrt{2}]$ which sends $f(x)$ to $f(\sqrt{2})$ (you have to show this makes sense.) Then follow the method of the proof that $\mathbb{R}[x]/\langle x^2 + 1 \rangle \cong \mathbb{C}$.