

# Math 202: Problem Set #3

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## Problem 1

Solve Exercise 1 in Section 13.4 of Dummitt and Foote.

## Problem 2

Solve Exercise 3 in Section 13.4 of Dummitt and Foote.

## Problem 3

Let  $\alpha$  be a real number such that  $\alpha^4 = 5$ . Prove that  $\mathbb{Q}(i\alpha^2)$  is a splitting field over  $\mathbb{Q}$ . Prove that  $\mathbb{Q}(\alpha(1+i))$  is not a splitting field over  $\mathbb{Q}$ .

## Problem 4

Find the splitting field of  $x^{3^8} - 1$  over the finite field  $\mathbb{Z}/3$ .

## Collaboration Policy

With each week's homework, you must turn in a one paragraph description of all the resources you used on that homework. You must mention any person you talked to about the problems, any book you looked at, any online resource (Wikipedia, Chegg,...) that you used. A sample paragraph is

On this week's homework, I worked on the problem set collaboratively with Gauss and Grothendieck at The Redroom during happy hour. We found an Alex Jones video (<http://youtube.blah.com>) that gave a really clear explanation of Fermat's Last Theorem. We compared our solutions against a solution key that we found on the /commutativealgebra/ board of 4chan (<http://blah.blah.edu>). We also got really stuck on Problem 5, and so we went to Chegg.com and paid an online tutor ("Zariski") \$50 to solve the problem for us.