Math 412, Winter 2014

Review problems for the first midterm exam:

In section 3.3, I suggest that you attempt problems 4, 9, 11, 12, 15, 28, 30 and 35(parts a,b,c,e and f)

I will hand out solutions to the last few problems on Monday February 10. However, you will not need to turn any of these problems in and they will not be graded.

3.3.15) Let $f : R \to S$ be a homomorphism of rings. If r is a zero divisor of r, must f(r) be a zero divisor of S?

3.3.28) a) Give an example of a homomorphism of rings $f : R \to S$ such that R has an identity but S does not. Does this contradict part 4 of Theorem 3.10?

b) Give an example of a homomorphism of rings $f : R \to S$ so that S has an identity but R does not.

3.3.30) Let $f: R \to S$ be a homomorphism of rings and let

$$K = \{ r \in R \mid f(r) = 0_S \}.$$

Prove that K is a subring of R.

3.3.35) Prove that the following rings are not isomorphic.

- (1) E and \mathbb{Z} .
- (2) $\mathbb{R} \times \mathbb{R} \times \mathbb{R} \times \mathbb{R}$ and $M(\mathbb{R})$.
- (3) $\mathbb{Z}_4 \times \mathbb{Z}_{14}$ and \mathbb{Z}_{16} .
- (4) $\mathbb{Z} \times \mathbb{Z}_2$ and \mathbb{Z} .
- (5) $\mathbb{Z}_4 \times \mathbb{Z}_4$ and \mathbb{Z}_{16} .