

**Math 306 Topics in Algebra, Spring 2013**  
**Homework 8, due Friday, April 19**

- (1) (5 pts/part) Find the character tables of the following groups.
  - (a)  $\mathbb{Z}_3 \times \mathbb{Z}_3$
  - (b)  $\mathbb{Z}_2 \times \mathbb{Z}_2 \times \mathbb{Z}_2$
- (2) (5 pts) Section 3.1, problem 41 (p. 89).
- (3) (5 pts) Use the character table for  $D_4$  we computed in class to determine the normal subgroups of  $D_4$ .
- (4) (7 pts) Find the character table for  $A_4$  and use it to find the normal subgroups of  $A_4$ .
- (5) (5 pts) Look up the definition of a (left) ideal of a ring  $R$ . Show that any (left) ideal of  $R$  is a module over  $R$ .
- (6) (5 pts) Section 10.1, problem 9 (p. 344).
- (7) (5 pts) Section 10.1, problem 18 (p. 344).
- (8) (4 pts) Show that any ring with identity is a  $\mathbb{Z}$ -algebra.