THE UNIVERSITY OF SYDNEY
MATH3962: Rings, Fields and Galois Theory

Semester 1	**Homework 2**	2009

This homework exercise is set for you get feedback on writing out proofs of elementary results and to practice working in a residues class ring.

If you would like some help getting started, or would to discuss your ideas, come and see my in Carslaw 527 at one of my timetabled consultation hours, Tuesday 12:00-1:00 or Wednesday 3:30-4:30, or at any other mutually convenient time.

Due: Thursday 2nd April at the beginning of the 2:00 pm Lecture

1. In any ring R show that $(-a)b = -(ab) = a(-b)$ for all $a, b \in R$.

2. In $\mathbb{Z}/13\mathbb{Z}$ each equivalence class has a representative one of $0, \pm 1, \pm 2, \ldots, \pm 6$. These are called the minimal class representative modulo 13.

(*i*) Find the minimal class representatives of the the distinct powers of 2 modulo 13.

(*ii*) Hence find minimal class representatives of the inverse of each non-zero element $\bar{x}$, $x = \pm 1, \pm 2, \ldots, \pm 6$, in the field $\mathbb{Z}/13\mathbb{Z}$.

(*iii*) Determine minimal class representatives the distinct powers of 3 modulo 13.