

## ALGEBRAIC STRUCTURES (MST20010)

### Problem sheet 0

The objective here is to try to identify some properties that are common to the sum and product of real numbers. We do this by breaking down some very simple computations into their most basic steps. It will be useful later in the course. This sheet will not be covered in the tutorials.

In the following,  $a$ ,  $b$  and  $x$  are all real numbers.

1. We consider the equation  $x+a = b$ . We know that the (unique) solution can be expressed as  $x = b + (-a)$ .

Write down, in as much detail as possible, the steps that take you from  $x+a = b$  to  $x = b + (-a)$ . By “as much detail as possible” I mean: Try to write it so that each step only involves the computation of one sum or the use of one property of the sum.

Try to make the list of all the properties of  $+$  that were useful in doing this.

2. We assume that  $a \neq 0$  and consider the equation  $x \cdot a = b$ . We know that the (unique) solution can be expressed as  $x = b \cdot a^{-1}$ .

Write down, in as much detail as possible, the steps that take you from  $x \cdot a = b$  to  $x = b \cdot a^{-1}$ . By “as much detail as possible” I mean: Try to write it so that each step only involves the computation of one product or the use of one property of the product.

Try to make the list of all the properties of  $\cdot$  that were useful in doing this.

3. Are there any similarities between what you did in 1 and what you did in 2?