

Mathematics 100A Homework 1

Due: Wednesday 7 October 2020

Instructions: Please write clearly and fully explain your solutions. It is OK to work with others to solve the problems, but if you do so, you should write your solutions up separately. Copying solutions from your peers or a solutions manual will be deemed academic misconduct. Please feel free to reach out to me or the TA if you have any questions.

1. This question has two parts.
 - (a) Consider the law of composition on $\mathbf{R}^3$ given by the cross product. Is this law of composition commutative?
 - (b) Define a law of composition on the $n \times n$ matrices $M_n(\mathbf{R})$ as $(A, B) \mapsto AB + BA$. Is this of composition commutative?
2. Chapter 2, exercise 1.1. You do not need to do the second part of the question, which refers to identities.
3. Suppose S is a set with an associative law of composition that is written multiplicatively. Check directly, without using Proposition 2.1.4 in the text, that $(a_1 a_2)(a_3(a_4 a_5)) = ((a_1(a_2 a_3))a_4)a_5$ for any $a_1, a_2, a_3, a_4, a_5 \in S$.