MATH 403 FALL 2021: HOMEWORK 1

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1. For any vectors $A = (a_1, a_2), B = (b_1, b_2)$ and a real number $r \in \mathbb{R}$, we have seen in class that
$$A + B = (a_1 + b_1, a_2 + b_2), \quad rA = (ra_1, ra_2).$$
Using these, show the eight properties of addition and scalar multiplications labeled in the textbook by (A1), (A2), (A3), (A4), (M1), (M2), (M3), (M4).
2. Using the eight properties only, Do Exercise 1.2, 1.3, 1.4, 1.5.
3. Exercise 1.6
4. Exercise 1.7
5. Exercise 1.8
6. Let $a, b, c, d, p, q \in \mathbb{R}$. Consider a system of linear equations
$$\begin{cases} ax + by = p, \\ cx + dy = q. \end{cases}$$
(Here, x and y are unknown variables.) Show that there exists a unique solution (x, y) for the system if and only if $ad - bc \neq 0$.
7. Exercise 1.11
8. Exercise 1.13