Homework

1. Show that the zero of vector addition is unique.
2. Show the axiom 0x = 0 by using other seven axioms in the definition of linear space
3. Suppose that the set X is the set of positive real numbers(i.e. $x > 0$) , if the addition and scalar multiplication with the field R of real numbers are defined as follows

$$x + y = xy, \quad cx = x^c,$$

Show this set under this addition and scalar multiplication is a linear space.

4. Suppose that the set X is 2-dimensional vector set of real numbers R^2 with the following addition and scalar multiplication with the field R of real numbers

$$\begin{bmatrix} x_1 \\ y_1 \end{bmatrix} \oplus \begin{bmatrix} x_2 \\ y_2 \end{bmatrix} = \begin{bmatrix} x_1 + x_2 \\ y_1 + y_2 + x_1 x_2 \end{bmatrix}$$

$$k \bullet \begin{bmatrix} x_1 \\ y_1 \end{bmatrix} = \begin{bmatrix} kx_1 \\ ky_1 + \dfrac{k(k-1)}{2} x_1^2 \end{bmatrix}$$

Show this set under this addition and scalar multiplication is a linear space.