Algebraic and Geometric Methods in Engineering and Physics

Homework 12

Due on January 4

1. (a) Show that $(\mathbb{R}^3, \times)$ is a Lie algebra.
   (b) Determine all Lie subalgebras and all ideals of $(\mathbb{R}^3, \times)$.
   (c) Show that $(\mathbb{R}^3, \times)$ is isomorphic to $(\mathfrak{so}_3(\mathbb{R}), [\cdot, \cdot])$, where

$$\mathfrak{so}_3(\mathbb{R}) = \left\{A \in M_{3\times 3}(\mathbb{R}) : A^t = -A\right\}$$

   and $[\cdot, \cdot]$ is the commutator.