1. Stillwell 2.5.1

2. Stillwell 2.5.2

3. Stillwell 2.5.3

4. A linear map $L : \mathbb{R}^n \to \mathbb{R}^n$ can be represented as a matrix as follows. Let e_i be the standard basis vectors and let $x_j = L(e_j)$. We can write x_j as a sum $\sum_i L^i_j e_i$. The matrix of L is the matrix L^i_j where i is the row index and j is the column index.

a) Consider the map $q- > -\overline{q}$ from $\mathbb{H}$ to $\mathbb{H}$. Show that this map is linear. Then compute its matrix representation. What is the determinant of this matrix representation?

b) Let u be a unit quaternion u. Consider the map $q \mapsto uq$ from $\mathbb{H}$ to $\mathbb{H}$. Show that this map is linear. Then compute its matrix representation. Then compute the determinant of this matrix representation.

5. Challenge. Without citing that an isometry of $\mathbb{R}^n$ that fixes the origin is linear, show that such a map takes lines through the origin to lines through the origin. Due in two weeks.