

## Pries: 470 Euclidean and non-Euclidean Geometry

### Homework 9: Euclidean Transformations

Due Friday March 24

#### Even more on Euclidean Transformations:

1. If  $T$  is a distance-preserving bijection that fixes two points  $P$  and  $Q$ , prove that  $T$  fixes every point  $R$  on the line between  $P$  and  $Q$ .
2. Stillwell 3.7.1-3.7.4
3. Find a 3-by-3 matrix with determinant 1 which is not orthogonal.
4. If  $A$  and  $B$  are two 2-by-2 matrices, show that  $(AB)^T = B^T A^T$ .
5. Suppose  $T = T_C \rho_B \gamma$  is an isometry of  $\mathbb{R}^2$ . Find the inverse of  $T$ .
6. Show that every isometry of  $\mathbb{R}^3$  that fixes  $(0, 0, 0)$  stabilizes the sphere.
7. Find the 3-by-3 matrix  $A$  so that the transformation of  $\mathbb{R}^3$  taking  $\vec{P}$  to  $A\vec{P}$  is:
  - a. the reflection over the  $xy$ -plane.
  - b. a rotation by 90 degrees that fixes every point on the  $x$ -axis.