Topics in geometry Quiz 5 7/20/5

Name:                               Signature:

Question 1

A wall-paper pattern is constructed by tiling the plane with rhombi congruent to
the rhombus with vertices $(±2, 0)$ and $(0, ±1)$, such that adjacent rhombi share an
edge.
Sketch the pattern and describe its Euclidean symmetries.

Question 2

Construct matrices for each of the following affine or projective linear trans-
formations, or explain why no such transformation exists.

- A rotation in $\mathbb{R}^2$ that has $(1, 1)$ as an invariant point and rotates through 60
degrees counterclockwise.

- A glide reflection in $\mathbb{R}^2$ that has the line $x - y + 1 = 0$ as an invariant line
  and maps the origin to the point $(0, 2)$.

- A transformation of the $\mathbb{Z}_2$ projective plane that maps the points:
  $A = (1, 0, 0)$, $B = (1, 1, 0)$ and $C = (1, 1, 1)$ to the points:
  $A' = (0, 1, 0)$, $B' = (0, 1, 1)$ and $C'' = (0, 0, 1)$, respectively.