

2120. *Proposed by Gregory Dresden, Jackson Gazin (student), and Kathleen McNeill (student), Washington & Lee University, Lexington, VA.*

Recall that the normalizer of a subgroup H of G is defined as

$$N_G(H) = \{g \in G \mid ghg^{-1} \in H \text{ for all } h \in H\}.$$

Determine $N_G(H)$, when $G = GL_2(\mathbb{R})$, the group of all invertible 2×2 matrices with real entries, and

$$H = SO_2(\mathbb{R}) = \left\{ \begin{pmatrix} \cos \theta & -\sin \theta \\ \sin \theta & \cos \theta \end{pmatrix} \mid \theta \in \mathbb{R} \right\}.$$