

Problem for the week of February 13, 2012

An $n \times n$ Householder matrix H has the form $H = I - 2\mathbf{u}\mathbf{u}^T$, where $\|\mathbf{u}\| = 1$. Let \mathbf{x}, \mathbf{y} be nonzero vectors in \mathbb{R}^n . If $\|\mathbf{x}\| = \|\mathbf{y}\|$, show that there exists a Householder matrix H such that $H\mathbf{x} = \mathbf{y}$.