Due Friday, November 30

1. Let \( S \) be the \( 2 \times 2 \) matrix
\[
\begin{pmatrix}
3/5 & 4/5 \\
4/5 & -3/5
\end{pmatrix}.
\]

(a) Find a line in \( \mathbb{R}^2 \) characterized by the property that the matrix \( S \) represents the reflection in that line relative to the standard basis of \( \mathbb{R}^2 \).

(b) Find an orthogonal\(^1\) matrix \( U \) for which
\[
U^{-1}SU
\]
is a diagonal matrix.

2. Is
\[
\begin{pmatrix}
-1 & 0 \\
1 & 1
\end{pmatrix}
\]
the matrix of the reflection in some line?

\(^1\)An orthogonal matrix is a square matrix that is inverted by its transpose. See the assignment for Nov. 7 where the properties of such a matrix were explored.