1. Find matrices C and P such that $A = PCP^{-1}$ and C is of the form $\begin{pmatrix} a & b \\ -b & a \end{pmatrix}$, where $a, b \in \mathbb{R}$.

   $A = \begin{pmatrix} -1 & 13 \\ -1 & 3 \end{pmatrix}$

   First, we need to compute the characteristic polynomial of A.

$$\det(A - \lambda I) = \begin{vmatrix} -1-\lambda & 13 \\ -1 & 3-\lambda \end{vmatrix} = \lambda^2 - 2\lambda + 10$$

   Therefore the eigenvalues of A are $1 \pm 3i$. The eigenspace for the eigenvalue $1 + 3i$ is

$$NS(A - (1+3i)I) = NS \begin{pmatrix} -2-3i & 13 \\ -1 & 2-3i \end{pmatrix}$$

   for which a basis is given by the single vector $\begin{pmatrix} 2-3i \\ 1 \end{pmatrix}$. Therefore we can take

$$P = \begin{pmatrix} 2 & -3 \\ 1 & 0 \end{pmatrix}$$

   and

$$C = \begin{pmatrix} 1 & 3 \\ -3 & 1 \end{pmatrix}.$$

2. Compute the orthogonal distance between the point $\begin{pmatrix} 5 \\ 0 \end{pmatrix}$ and the line between the origin and $\begin{pmatrix} 4 \\ 3 \end{pmatrix}$.

   First, we compute the projection onto the line:

$$\frac{20}{16+9} \begin{pmatrix} 4 \\ 3 \end{pmatrix} = \begin{pmatrix} 16/5 \\ 12/5 \end{pmatrix}$$

   Then the distance between the point and the line is the norm

$$\left\| \begin{pmatrix} 5 \\ 0 \end{pmatrix} - \begin{pmatrix} 16/5 \\ 12/5 \end{pmatrix} \right\| = \left\| \begin{pmatrix} 9/5 \\ -12/5 \end{pmatrix} \right\| = \frac{\sqrt{81+144}}{5} = 3.$$