Math 1553 Worksheet §5.5

1. Answer true or false, and justify your answer. In each case, A is a matrix whose entries are real.

   a) If A is the matrix that implements rotation by $143°$ in $\mathbf{R}^2$, then A has no real eigenvalues.

   b) A 3×3 matrix can have a non-real complex eigenvalue with multiplicity 2.

   c) A 3×3 matrix can have eigenvalues $3, 5$, and $2 + i$.

2. Let $A = \begin{pmatrix} 1 & 2 \\ -2 & 1 \end{pmatrix}$.

a) Find all eigenvalues and eigenvectors of A.

b) Using the eigenvalue with negative imaginary part, write $A = PCP^{-1}$, where C is a rotation followed by a scale. Describe what A does geometrically.