

Math 1553 Worksheet 10

November 11, 2016

1. Let A and B be 3×3 real matrices. Answer yes / no / maybe:
 - a) Can the eigenvalues of A be 3, 5, and $2 + i$?
 - b) Can A have three complex (non-real) eigenvalues?
 - c) Can A have a complex eigenvalue with multiplicity 2?
 - d) Suppose that A has one eigenvalue of algebraic multiplicity 3. Is A diagonalizable?
 - e) Suppose that A has two distinct eigenvalues. Is it diagonalizable?
 - f) Suppose that A has three distinct eigenvalues. Is it invertible?
 - g) If A and B both have eigenvalues $-1, 0, 1$, then A is similar to B .
 - h) If A and B have the same eigenvalues, then A is similar to B .
 - i) If A and B have one real and one complex eigenvalue in common, then A is similar to B .
2. Let $A = \begin{pmatrix} 1 & 2 \\ -2 & 1 \end{pmatrix}$.
 - a) Find all (complex) eigenvalues and eigenvectors of A .
 - b) Write $A = PCP^{-1}$, where C is a rotation followed by a scale.
 - c) What does A do geometrically? Draw a picture.

3. Let $A = \begin{pmatrix} 4 & -3 & 3 \\ 3 & 4 & -2 \\ 0 & 0 & 2 \end{pmatrix}$.

a) Find all (complex) eigenvalues and eigenvectors of A .

b) Write $A = PCP^{-1}$, where C is a block diagonal matrix, as in the slides for 11/9.

c) What does A do geometrically? Draw a picture.