

# Worksheet 12

**Objectives:** (1) Understand conditioning of eigenvalue problems (2) Know effect of matrix transformations on eigenvalues (3) Understand behavior of power iteration

## Problem 1: Eigenvalue problem: properties and conditioning

- (a) A  $3 \times 3$  matrix has 2 distinct eigenvalues. Is it necessarily defective?
  
- (b) Why is the eigenvalue problem well-conditioned for symmetric matrices?
  
- (c) Suppose  $\lambda = 2$  is an eigenvalue of  $A$ . Name an eigenvalue of  $(A^2 - 2)^{-1}$ .

## Problem 2: Power iteration

- (a) Power iteration converges to...
  
- (b) Name two problems that can occur when using (normalized) power iteration.
  
- (c) Inverse power iteration converges to...
  
- (d) What is the Rayleigh quotient of  $\begin{bmatrix} 1 \\ 1 \end{bmatrix}$  with the matrix  $A = \begin{bmatrix} 2 & 1 \\ 1 & 2 \end{bmatrix}$ ?