

Last name _____

First name _____

LARSON—MATH 610—CLASSROOM WORKSHEET 39
Interlacing Theorem.

(Chp. 5). *inner product, inner product space, $\langle \cdot \cdot \rangle$, orthogonal vectors, \perp , $\|\cdot\|$.*

(Chp. 6). *orthogonal basis.*

(Chp. 7). *unitary matrix, unitarily similar.*

(Chp. 8). *U^\perp , $V = U \oplus U^\perp$, orthonormal projection, $P_U \hat{v}$.*

(Chp. 9). *eigenvalue, eigenvector, eigenpair, nullity, annihilating polynomial, spectrum, Gershgorin disk, diagonally dominant. (Chp. 15). positive semi-definite, square root $A^{\frac{1}{2}}$.*

(Chp. 18). *Rayleigh quotient.*

Review:

1. What is a *Rayleigh quotient*?
2. What is **Rayleigh's Theorem**?
3. How can Rayleigh quotients be used to bound the largest and smallest eigenvalues of a Hermitian matrix?
4. What does Rayleigh's Theorem imply about the relationship between the diagonal elements of a matrix and its eigenvalues?

Chp. 18 of Garcia & Horn, Matrix Mathematics

1. What is **Cauchy's Interlacing Theorem**?

2. Why is it true?

3. What is an application?