

True Or False

- 1. False** If λ is an eigenvalue of a matrix A , then the linear system $(\lambda I - A)\mathbf{X} = \mathbf{0}$ has only the trivial solution.
- 2. True** If 0 is an eigenvalue of a matrix A , then A^2 is singular.
- 3. True** If A is diagonalizable, then there is a unique matrix P such that $P^{-1}AP$ is diagonal.
- 4. True** If A is diagonalizable, then A^T is diagonalizable.
- 5. False** Every eigenvalue of a complex symmetric matrix is real.
- 6. True** If A is a square matrix with distinct real eigenvalues, then it is possible to solve $X' = AX$ by diagonalization.
- 7. False** The inner product operation must satisfy 2 conditions.
- 8. True** If the columns of A are linearly independent, the equation $Ax = b$ has exactly one least squares solution.
- 9. True** In an inner product space $(V, \langle \cdot, \cdot \rangle)$ if x and y are unit vectors orthogonal to each other then $\|x + y\| = \sqrt{2}$.
- 10. False** The inner product of two vectors cannot be a negative real number.
- 11. True** If we have $\vec{u} = (4, 3)$, $\vec{v} = (3, 5)$ then $\|\vec{v}\|$ is $\sqrt{34}$.
- 12. True** If a square matrix A is orthogonal, then $A^{-T} = A$.
- 13. True** If A is a square matrix, and $\det(A) = 2$, then A is not orthogonal.
- 14. True** If S is an orthogonal basis for n -dimensional inner product space V , then V is the Euclidean inner product space.
- 15. False** A square matrix whose rows form an orthogonal set is orthogonal.
- 16. False** An 3×2 matrix A is orthogonal if $A^T A = I$.
- 17. False** Every orthogonal matrix is orthogonally diagonalizable.
- 18. True** If A is orthogonally diagonalizable, then A has real eigenvalues.
- 19. False** If A is an 3×5 matrix and T is a transformation defined by $T(x) = Ax$, then the domain of T is \mathbb{R}^5 .

- 20. True** A linear transformation preserves the operations of vector addition and scalar multiplication.
- 21. True** If L is a linear operator mapping a vector space V into a vector space W , then $L(\mathbf{0}_V) = \mathbf{0}_W$.
- 22. True** The range of L is the image of the entire vector space.
- 23. true** If A and B are the same size and both represent the same linear operator, they are similar.
- 24. True** If a square matrix A has an LU -decomposition, then A has a unique LDU -decomposition.
- 25. False** Every square matrix has an LU -decomposition.
- 26. False** If A is an $m \times n$ matrix, then $A^T A$ is an $m \times m$ matrix
- 27. False** If A is an $m \times n$ matrix, then the eigenvalues of $A^T A$ are positive real numbers.
- 28. True** Every $m \times n$ matrix has a singular value decomposition.
- 29. True** In linear programming problems, a linear objective function that is to be maximized or minimized.
- 30. True** All variables in linear programming problems restricted to nonnegative values.
- 31. True** The maximization or minimization of a quantity is the objective of linear programming.
- 32. false** The following LP problem has an unbounded feasible region:
- Minimize $c = x - y$
 subject to $4x - 3y \leq 0$
 $x + y \leq 10$
 $x \geq 0, y \geq 0$
- 33. False** Every minimization problem can be converted into a standard maximization problem.