1. L=[0 1.3 1.8 0.9 0.2; 0.6 0 0 0 0; 0 0.8 0 0 0; 0 0 0.8 0 0;0 0 0 0.4 0]
   A. Use eig to find the sole positive eigenvalue
   B. Find the normalized eigenvector
2. L=[0 .045 .391 .472 .484 .546 .543 .502 .468 .459 .433 .421]
   a=[.845 .975 .965 .950 .926 .895 .850 .786 .691 .561 .370]
   A=diag(a);
   A=[A zeros(11,1)];
   L=[L;A]
   A. Use eig to find the sole positive eigenvalue
   B. Find the normalized eigenvector
3. A **vector space** is a set *V* of elements called **vectors,** having operations of addition and scalar multiplication defined on it. Let **u**, **v**, and **w** be arbitrary elements of *V*, and *c* and *d* be scalars.

   A. State **Closure Axioms.**

   B. State addition axioms.

   C. **State the** scalar multiplication axioms.

4. Let *V* be the set of all functions having the real numbers as their domains. Verify axioms 1, 2, 5 and 6 for vector spaces of functions

5. Let P_n denote the set of real polynomial functions of degree $\leq n$. Prove that P_n is a vector space if addition and scalar multiplication are defined on polynomials in a pointwise manner.

6. Let *U* be a subspace of a vector space *V*. Prove that *U* contains the zero vector of *V*.

7. Let *W* be the set of vectors of the form $(a, a, a + 2)$. Show that *W* is not a subspace of $\mathbf{R}^3$.

8. Let $\mathbf{v}_1$ and $\mathbf{v}_2$ span a subspace *U* of a vector space *V*. Let k_1 and k_2 be nonzero scalars. Show that $k_1\mathbf{v}_1$ and $k_2\mathbf{v}_2$ also span *U*.

9. (10%) Let $\mathbf{v}_1, ..., \mathbf{v}_m$ be vectors in a vector space *V*. Let *U* be the set consisting of all linear combinations of $\mathbf{v}_1, ..., \mathbf{v}_m$. Then *U* is a subspace of *V* spanned by the vectors $\mathbf{v}_1, ..., \mathbf{v}_m$. *U* is said to be the vector space *generated* by $\mathbf{v}_1, ..., \mathbf{v}_m$. It is denoted Span$\{\mathbf{v}_1, ..., \mathbf{v}_m\}$

10. Determine whether the vector (3, −1, 11) lies in the subspace Span{(−1, 5, 3), (2, −3, 4)} of $\mathbf{R}^3$.
11. Determine whether the set {(1, 2, 0), (0, 1, −1), (1, 1, 2)} is linearly independent in $\mathbf{R}^3$.

12. Show

    A. The set {x2 + 1, 3x − 1, −4x + 1} is linearly independent in P_2.

    B. The set {x + 1, x − 1, −x + 5} is linearly dependent in P_1.

13. A set consisting of two or more vectors in a vector space is linearly dependent if and only if it is possible to express one of the vectors as a linear combination of the other vectors.

14. Let V be a vector space. Any set of vectors in V that contains the zero vector is linearly dependent.

15. Let the set $\{\mathbf{v}_1, ..., \mathbf{v}_m\}$ be linearly dependent in a vector space V. Any set of vectors in V that contains these vectors will also be linearly dependent.

16. Let the vectors $\mathbf{v}_1, ..., \mathbf{v}_n$ span a vector space V. Each vector in V can be expressed uniquely as a linear combination of these vectors if and only if the vectors are linearly independent.

17. Let $\{\mathbf{v}_1,...,\mathbf{v}_n\}$ be a basis for a vector space V. If $\{\mathbf{w}_1,...,\mathbf{w}_m\}$ is a set of more than n vectors in V, then this set is linearly dependent.

18. All bases for a vector space V have the same number of vectors.

19. Let V be a vector space of dimension n. Let $\{\mathbf{v}_1, \ldots, \mathbf{v}_m\}$ be a set of m linearly independent vectors in V, where $m < n$. Then there exist vectors $\mathbf{v}_{m+1}, \ldots, \mathbf{v}_n$ such that $\{\mathbf{v}_1, \ldots, \mathbf{v}_m, \mathbf{v}_{m+1}, \ldots, \mathbf{v}_n\}$ is a basis of V.