Vv256 Midterm Exam I Guiding questions

After completion the first module of the course, you should be able

1. to derive and solve simple models of various physical, chemical and biological phenomena using first-order ODEs.
2. to formulate existence and uniqueness theorems for linear and nonlinear first-order ODE and apply them to find intervals of existence of the solution.
3. to classify first-order ODEs and apply the corresponding procedures to find their solutions (focus on separable, linear, exact, homogeneous equations and the method of integrating factors).
4. to explain models of logistic growth, logistic population with harvesting, population with a critical threshold, find and plot their solutions.
5. to solve first-order implicit ODEs.
6. to explain the concepts of a singular solution, an envelope, tac locus, cusp locus, nodal locus and apply p, C-discriminant methods to find singular solutions and the mentioned locus.
7. to explain and apply the concept of linear independence for elements of various linear spaces.
8. for a given matrix, to find its inverse, eigenvalues and corresponding eigenvectors (review)
9. to define metrics, norms and inner (review)