Math 285 Final Exam Outline.

1. Solving differential equations:
   a) Separation of variables.
   b) Integrated factor.
   c) Homogeneous of degree zero.
   d) Exact.
   e) Bernoulli
   f) Substitution: \( \frac{dy}{dx} = F(ax + by) \)

2. Underdamp / over damped / critically damped.
   a) Find phase – amplitude form.
   b) How often the object passes the equilibrium points.
   c) Estimate the time for which

3. Solving Cauchy DE.


5. Prove / disprove if \( S \) is a vector space.
   a) Prove that \( V \) with \( <,> \) is an inner – product vector space.
   b) Given two vectors in \( V \), then find \( \text{proj}_u v \)

6. a) Prove that \( T: V \mapsto U \) is a linear transformation.
   b) Determine a matrix of representation of \( T \) with respect to their standard bases. \( [T]^C_B \)
   c) Determine \( \text{Ker}(T) \) and \( \text{Rng}(T) \).
   d) Determine whether \( T \) is injective, surjective or isomorphism.

7. Find a minimum set of \( S = \text{span}(v_1, v_2, \ldots, v_n) \)

8. Prove some statements (study all the proofs in lectures)

10. Prove a matrix \( A \) is diagonalizable, and then find \( A^n \)


12. Solve systems of linear DE. (Chapter 7)

13. Solve system of linear DE by variation of parameter method (Fundamental matrix).

14. Classify if equilibrium points are sink, source, spiral, saddle, nodes.

15. Solve system of non – linear DE by Jacobian.
