Topics for Exam 2

1. **Analysis of Linear Systems**

   1.1 Construction of solutions.

   1.2 Linearly independent solutions.

   1.3 The fundamental matrix.

   1.4 Existence and uniqueness for linear, initial value problems.

   1.5 Stability of equilibrium points.

2. **Applications to Second Order Linear Differential Equations**

   2.1 Construction of solutions of linear second order equations.

   2.2 Linearly independent solutions.

   2.3 Structure of the solutions space for linear, second-order, homogeneous differential equations (Problem 3 in Assignment #10)

   2.4 Existence and uniqueness for the initial value problem.

3. **Analysis of General Systems**

   3.1 Local Existence and Uniqueness Theorem.

   3.2 Maximal interval of existence.

   3.3 Global existence.

Relevant sections in the online class notes: 4.1.5, 4.2, 4.2.1, 4.2.2, 5.1 and 5.2

Relevant sections in text: Sections 2.6, 3.1, 3.4 and 3.6.

Relevant assignments: 6, 7, 8, 9, 10 and 11.

Important concepts: Linearly independent functions; fundamental matrix; local existence and uniqueness; maximal interval of existence; global existence and uniqueness; equilibrium point; stability.

Important skills:

- Know how to compute fundamental matrices for homogenous, autonomous linear systems.
- Know how to construct solutions of second order linear equations with constant coefficients.
- Know how to apply the existence and uniqueness theorems.
- Know how to determine stability of equilibrium points of linear systems