Introduction to Ordinary Differential Equations
Outline for Exam 2

Test Date: 11/16/2022

NO BOOKS OR NOTES WILL BE PERMITTED! NO ELECTRONIC DEVICES ARE PERMITTED!

I. Solving Systems of Linear Equations by Row Reduction

A. Be able to solve systems of linear equations by forming an augmented matrix and performing row reduction.

B. Know when a matrix is in Reduced Row Echelon Form (RREF).

II. Basics of Matrices

A. Know how matrices act on vectors.

B. Know how to perform basic matrix operations (addition, scalar multiplication, multiplication of matrices).

III. Determinants and Inverse Matrices

A. Be able to compute the determinant of square matrices.

B. Understand what the determinant tells us about invertibility.

C. Be able to find the inverse of a matrix (up to size 4×4).

III. Vector Spaces

A. Know basic examples of vector spaces ($\mathbb{R}^n, \mathcal{P}^n, \mathbb{R}^{m\times n}$,$\mathcal{C}[a,b]$).

B. Know what is meant by a linear combination of vectors and the span of a set of vectors.

B. Be able to determine if a given subset of a vector space is a subspace.

IV. Linear Independence and Bases

A. Be able to determine if a set of vectors is linearly independent.

B. Be able to determine if a given set of vectors is a basis for the entire vector space.

C. Know how to set up a change of basis matrix and use it to find the coefficients of a vector in terms of the new basis.

D. Understand the Row Space, Column Space, and Null Space of a matrix and how to find their dimensions.

E. Know that if M is an $m \times n$ matrix, $\text{Rank}(M) + \text{Nullity}(M) = n$.