Introduction

In this session we learn general results about the solutions of any $n \times n$ linear DE system (not necessarily constant coefficient).

First we will learn the some general theory for linear systems. This will be familiar to you from our study of linear ODE's.

After that we will discuss the *fundamental matrix* which is an efficient way to package all the solutions of a linear system of differential equations. It will also allow us to use matrix algebra when working with such systems. We will use the fundamental matrix to derive the *variation of parameters* formula, which is used to solve an inhomogeneous system with arbitrary output.

Next we will define the *matrix exponential* and express the fundamental matrix in terms of it. The matrix exponential has many nice theoretical properties.

Finally we will recast what we've done in the language of *decoupling* which is commonly used by engineers.

This session is long and covers many important topics. It is something of a sidelight in this course and will not be used in subsequent sessions.

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