

Notes for lecture 14

1. Date: July 11. This lecture is based on Sections 7.8 and 7.9 of the main textbook.
2. Section 7.8 considers homogeneous systems linear differential equations with constant coefficients when the roots of the characteristic equations are repeated.
 - a. When the algebraic multiplicity of the eigenvalues is not equal its geometric multiplicity, the matrix does not have a full set of eigenvectors and therefore cannot be diagonalized. In this case the matrix can be made “as diagonal as possible” which is represented by Jordan matrices and Jordan cells (equivalents of diagonal matrixes). This is a bit difficult topic as it presumes good knowledge of advanced linear algebra, and the key point is essentially in the construction of generalized eigenvectors.
3. Section 7.9 considers solving non-homogeneous equations by two methods (undetermined coefficients and variation of parameters).
 - a. You are already familiar with methods and should have no difficulties in grasping the concept. In this section, the above methods are just dressed in matrix settings (by using either matrix exponential or its equivalent – the special fundamental matrix), so the idea is the same, but the appearance is different from what we dealt with before. That is all you need to know at the beginner level.
4. It is highly recommended to refresh your knowledge of Linear Algebra. For your reference, supplemental material (BrushUp_Chapter 7.2-7.3, and BrushUp_LA.pdf file) is included.