**System of Differential Equations**

**Linear Homogeneous**

, ,

Case 1: has linearly independent eigenvectors , eigenvalues

*Note: choose linearly independent eigenvectors*

Complex eigenvalues: consider only the negative conjugate

Use Euler’s equation in the solution:

🡺 let be absorbed by the constants

Diagonalization Method: ( has linearly independent eigenvectors)

, , are the eigenvectors

Let 🡺 🡺 🡺 🡺

Find solution for 🡺

Case 2: has fewer than linearly independent eigenvectors.

Let be a double eigenvalue (2 roots repeated).

Find :

Let be a triple eigenvalue (3 roots repeated).

Find :

Find :

Find :

Reduction to upper triangular form

Let denote a matrix short of eigenvectors and:

(upper triangular)

Then:

Let 🡺 🡺

Do backsubstituition from and up.

**Linear non homogeneous**

, ,

Case 1) is diagonalizable

**🡺 🡺**

Solve each equation using integrating factor, undet. coeff etc.

For example, integrating factor :

Case 2) is reducible to upper triangular form (less linearly independent eigen vectors)

Let

**(**do backsubstitution...)