

Chapter 8: Matrix Exponential Methods

Definitions

Fundamental matrix: *takes the form*

$$\Phi(t) = [\vec{x}_1 \quad \cdots \quad \vec{x}_n]$$

Nonhomogeneous linear system: *takes the form*

$$\vec{x}' = A\vec{x} + \vec{f}(t)$$

Differential Equations and SolutionsSolution to homogenous systems (1)

$$\vec{x}' = A\vec{x} \tag{1a}$$

$$\vec{x} = c_1\vec{x}_1 + \cdots + c_n\vec{x}_n \tag{1bi}$$

$$\vec{x} = \Phi\vec{c} \tag{1bii}$$

Solution to nonhomogeneous systems (2)

$$\vec{x}' = A\vec{x} + \vec{f}(t) \tag{2a}$$

$$\vec{x}_p = \text{guess based on } \vec{f}(t) \tag{2bi}$$

$$\vec{x}_p = \Phi \int \Phi^{-1} \vec{f} dt \tag{2bii}$$

$$\vec{x} = \vec{x}_c + \vec{x}_p \tag{2c}$$