

Math 2280-001  
Week 12 concepts and homework  
sections 5.6-5.7  
Due Friday April 10 (at the start of class)

5.6 (5.5 in old text) *Fundamental matrices and matrix exponentials.*

1, 3, 11, 23, 25, 31, 39.

5.7 (5.6 in old text) *Nonhomogeneous Linear Systems: undetermined coefficients and variation of parameters.*

1, 13, 15, 19, 23. Do 13 by hand. On 19, 23 you may use technology to compute variation of parameters formulas for the solutions, as long as you hand in printouts to verify your work.

**week 12.1** Rework the exam 2 tank IVP problem

$$\begin{bmatrix} x_1'(t) \\ x_2'(t) \end{bmatrix} = \begin{bmatrix} -3 & 1 \\ 2 & -2 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 120 \\ 0 \end{bmatrix}$$
$$\begin{bmatrix} x_1(0) \\ x_2(0) \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$$

by using the variation of parameters formula (28) in this section, namely that the solution to

$$\begin{aligned} \underline{\mathbf{x}}'(t) &= A \underline{\mathbf{x}} + \underline{\mathbf{f}} \\ \underline{\mathbf{x}}(0) &= \underline{\mathbf{x}}_0 \end{aligned}$$

is given by

$$\underline{\mathbf{x}}(t) = e^{At} \underline{\mathbf{x}}_0 + e^{At} \int_0^t e^{-As} \underline{\mathbf{f}}(s) ds.$$

We will discuss this formula in class on Wednesday. Do this problem by hand, although you may use technology to check the various steps.