

Test 2 topics

Things to know for **Test 2, Friday June 26th**

4.2 & 4.3: 2nd Order Linear Homogeneous Diff.Eq.

- Find the auxiliary equation
- Find the general solution (3 cases)
- Solve an IVP

ex p. 164 #3,7,13,15,18, 26,37,43

ex p. 172 #1,3,19, 21,25

4.4 & 4.5: Undetermined Coefficients & Superposition Principle

- Find y_c
- Use the method of Undetermined Coefficients to find y_p
- Know what to do if y_c and y_p overlap
- Solve IVP's

ex p. 180 #13,15,21,33,34

ex p. 185 #1,17,19,21,23,25,33,35

4.6: Variation of Parameters

- Know when to use Variation of Parameters
- Use the method of Variation of Parameters to find y_p
- Solve IVP's

ex p. 191 #1,2,3,5,7,13,15

4.9 & 4.10: Springs

- Know how to setup the spring equation $mx'' + bx' + kx = F_{ext}$
- Solve IVP's
- Know different kinds of damping
- Be able to find a steady-state solution

ex p. 220 # 1,7,9 (You will NOT have to find amplitude, period and frequency, etc.)

ex p. 228 # 9,11,13

7.2 & 7.3: Laplace Transforms

- Know the definition of Laplace Transform, and be able to use it
- Find the domain of the Laplace Transform
- Find the Laplace Transform of a function from a table

$$\begin{aligned} L\{c_1 f + c_2 g\} &= c_1 L\{f(t)\} + c_2 L\{g(t)\} \\ L\{e^{at}f(t)\} &= L\{f(t)\} \text{ as a function of } (s-a) \end{aligned}$$

$$L\{t^n f(t)\} = (-1)^n \frac{d^n}{ds^n} L\{f(t)\}$$

- Know the properties:
- $$\begin{aligned} L\{f'(t)\} &= sL\{f(t)\} - f(0) \\ L\{f''(t)\} &= s^2L\{f(t)\} - sf(0) - f'(0) \end{aligned}$$

$$L\{u(t-a)f(t-a)\} = e^{-as}L\{f(t)\}$$

$$L\{u(t-a)f(t)\} = e^{-as}L\{f(t+a)\}$$

$$L^{-1}\{e^{-as}F(s)\} = f(t-a)u(t-a)$$

ex p. 360 #1,3,9,12

ex p. 356 #13,15,17,19

ex p. 365 #1,3,5,9,21

7.4: Inverse Laplace Transforms

- Know the method of partial fractions

ex p. 374-375 # 1,3,5,21,23,25

7.5: IVP's with Laplace Transforms

- Know the method of Laplace Transforms

ex p. 382-383 #1,3,4,5,11,25,35

7.6: Unit Step Functions

- Know the definition of the unit step function
- Express a function using unit step functions and be able to compute its Laplace Transform
- Express an Initial Value Problem using unit step functions and be able to solve the IVP

ex p. 390 #5,7,11,13,15,19,21,23,29,33