

Note the following review problems DO NOT cover all problem types which may appear on the final.

6.3 preliminaries:

1a.) Suppose  $f(t) = t^2$ , then  $f(t - 2) =$  \_\_\_\_\_

1b.) Suppose  $f(t) = t^2 + 3t + 4$ , then  $f(t - 2) =$  \_\_\_\_\_

1c.) Suppose  $f(t) = \sin(t) + e^{8t}$ , then  $f(t - 2) =$  \_\_\_\_\_

2a.) Suppose  $f(t - 2) = (t - 2)^2$ , then  $f(t) =$  \_\_\_\_\_

2b.) Suppose  $f(t - 2) = (t - 2)^2 + 3(t - 2) + 4$ , then  $f(t) =$  \_\_\_\_\_

2c.) Suppose  $f(t - 2) = \sin(t - 2) + e^{8(t-2)}$ , then  $f(t) =$  \_\_\_\_\_

3a.) Suppose  $f(t - 2) = t^2 + 2t + 5$ , then  $f(t) =$  \_\_\_\_\_

3b.) Suppose  $f(t - 2) = 3t^2 + 8t + 1$ , then  $f(t) =$  \_\_\_\_\_

3c.) Suppose  $f(t) = \cos(t) + 4^{8t}$ , then  $f(t) =$  \_\_\_\_\_

Chapter 6:

4.) Find the LaPlace transform of the following:

4a.)  $\mathcal{L}(u_3(t^2 - 2t + 1)) =$  \_\_\_\_\_

4b.)  $\mathcal{L}(u_4(e^{-8t})) =$  \_\_\_\_\_

4c.)  $\mathcal{L}(u_2(t^2 e^{3t})) =$  \_\_\_\_\_

5.) Find the inverse LaPlace transform of the following:

5a.)  $\mathcal{L}^{-1}(e^{-8s} \frac{1}{s-3}) =$  \_\_\_\_\_

5b.)  $\mathcal{L}^{-1}(e^{4s} \frac{1}{s^2-3}) =$  \_\_\_\_\_

5c.)  $\mathcal{L}^{-1}(e^s \frac{1}{(s-3)^2+4}) =$  \_\_\_\_\_

5d.)  $\mathcal{L}^{-1}(e^{-s} \frac{5}{(s-3)^4}) =$  \_\_\_\_\_

5e.)  $\mathcal{L}^{-1}(\frac{e^s}{4s}) =$  \_\_\_\_\_

5f.)  $\mathcal{L}^{-1}(e^s) =$  \_\_\_\_\_

6.) Use the definition and not the table to find the LaPlace transform of the following:

6a.)  $\mathcal{L}(t^3) =$  \_\_\_\_\_

6a.)  $\mathcal{L}(\cos(t)) =$  \_\_\_\_\_

7.) Find the inverse LaPlace transform of the following. Leave your answer in terms of a convolution integral:

7a.)  $\mathcal{L}^{-1}\left(\frac{1}{(s-2)(s^2+4)}\right) =$  \_\_\_\_\_

7b.)  $\mathcal{L}^{-1}\left(\frac{1}{(s-2)(s^2-4s+5)}\right) =$  \_\_\_\_\_

7c.)  $\mathcal{L}^{-1}\left(\frac{2s}{(s-2)(s^2-4s+5)}\right) =$  \_\_\_\_\_

8.) Find  $f * g$

8a.)  $4t * 5t^4 =$  \_\_\_\_\_

8b.)  $5t^4 * 4t =$  \_\_\_\_\_

8c.)  $\sin(t) * e^t =$  \_\_\_\_\_

Make sure you can also solve a quick differential equation using the LaPlace transform and use any of the formulas on p. 304.

Chapter 3:

9.) Solve the following initial problems:

9a.)  $y'' + 6y' + 8y = 0, y(0) = 0, y'(0) = 0$

9b.)  $y'' + 6y' + 9y = 0, y(0) = 0, y'(0) = 0$

9c.)  $y'' + 6y' + 10y = 0, y(0) = 0, y'(0) = 0$

9d.)  $y'' + 6y' + 8y = \cos(t), y(0) = 0, y'(0) = 0$

9e.)  $y'' + 6y' + 9y = \cos(t), y(0) = 0, y'(0) = 0$

9f.)  $y'' + 6y' + 10y = \cos(t), y(0) = 0, y'(0) = 0$

3.8: 1-5, 7, 11, 14, 3.9: 1 - 8

Make sure you understand sections 3.8, 3.9

10.) Solve the following initial problems:

10a.)  $y' + 3y + 1 = 0, y(0) = 0$

10b.) ,  $y(0) = 0$

\*10c.)  $\cos(t)y' - \sin(t)y = \frac{1}{t^2}$ ,  $y(0) = 0$

10d.)  $y' = \frac{3x^2-2}{xy-xy^2}$ ,  $y(0) = 0$

Chapter 1:

11.) For each of the following, draw the direction field for the given differential equation. Based on the direction field, determine the behavior of  $y$  as  $t \rightarrow \infty$ . If this behavior depends on the initial value of  $y$  at  $t = 0$ , describe this dependency.

11a.)  $y' = y$

11b.)  $y' = 1$

11c.)  $y' = y(y + 4)$

Chapter 7:

12.) Transform the given equation into a system of first order equations:

12a.)  $x''' - 2x'' + 3x' - 4x = t^2$

12b.)  $x'''' - 2x'' + 3x' - 4x = t^2$

Make sure you also study exam 1 and 2 as well as everything else. Remember the above list is INCOMPLETE.

\* means optional type problem. If a problem like 9c appeared on the final, it would be in the "choose" section.