Exam 3: "Study Guide"

Math 2410-010/015

May 1, 2017

The final exam is cumulative, that is, it will cover every section we have discussed this semester. Below, as with Exam 2, I have gathered a bank of questions from each of these sections that I intend to use to generate around 70% of the exam. The questions on the exam will not match these *exactly* but will be of a similar form and content. Some exam questions may draw on more than one of these at a time.

It is my intention that if you can solve all of these problems and do nothing else, you should be able to earn a C on the exam.

I will generate the rest of the exam based upon ideas I emphasized in class, quiz questions and homework questions not listed here.

If you have any questions, as always, let me know.

1 Post exam 2 material

3.5: 6, 18, 21

3.6: 3, 5, 7, 30

4.1: 5, 6, 12

4.2: 3, 13, 16

6.1: 3, 23, 25

6.3: 27, 28, 29

To solve the problems similar to those in chapter 6, you will have access to the following table about the Laplace Transform. If a fact is writtin in blue, you are responsible for being able to verify this directly from the definition.

$y(t) = \mathscr{L}^{-1}[Y]$	$Y(s) = \mathscr{L}[y]$	$y(t) = \mathscr{L}^{-1}[Y]$	$Y(s) = \mathscr{L}[y]$
$y(t) = e^{at}$	$Y(s) = \dfrac{1}{s-a}$ for $(s > a)$	$y(t) = t^n$	$Y(s) = \dfrac{n!}{s^{n+1}}$ for $(s > 0)$
$y(t) = \sin(\omega t)$	$Y(s) = \dfrac{\omega}{s^2+\omega^2}$	$y(t) = \cos(\omega t)$	$Y(s) = \dfrac{s}{s^2+\omega^2}$
$y(t) = e^{at}\sin(\omega t)$	$Y(s) = \dfrac{\omega}{(s-a)^2+\omega^2}$	$y(t) = e^{at}\cos(\omega t)$	$Y(s) = \dfrac{s-a}{(s-a)^2+\omega^2}$
$y(t) = t\sin(\omega t)$	$Y(s) = \dfrac{2\omega s}{(s^2+\omega^2)^2}$	$y(t) = t\cos(\omega t)$	$Y(s) = \dfrac{s^2-\omega^2}{(s^2+\omega^2)^2}$
$y(t) = u_a(t)$	$Y(s) = \dfrac{e^{-as}}{s}$ for $(s > 0)$	$y(t) = \delta_a(t)$	$Y(s) = e^{-as}$

Rules for Laplace Transforms	Rules for Inverse Laplace Transform
$\mathscr{L}\left[\dfrac{dy}{dt}\right] = s\mathscr{L}[y] - y(0)$	
$\mathscr{L}\left[\dfrac{d^2y}{dt^2}\right] = s^2\mathscr{L}[y] - sy(0) - y'(0)$	
$\mathscr{L}[y_1 + y_2] = \mathscr{L}[y_1] + \mathscr{L}[y_2]$	$\mathscr{L}^{-1}[Y_1 + Y_2] = \mathscr{L}^{-1}[Y_1] + \mathscr{L}^{-1}[Y_2]$
$\mathscr{L}[ky] = k\mathscr{L}[y]$	$\mathscr{L}^{-1}[kY] = k\mathscr{L}^{-1}[Y]$

Here is an example showing how to verify $\mathscr{L}[y_1 + y_2] = \mathscr{L}[y_1] + \mathscr{L}[y_2]$.

Example: Notice

$$\mathscr{L}[y_1+y_2] = \int_0^\infty (y_1+y_2)e^{-st}\,dt = \int_0^\infty y_1e^{-st}+y_2e^{-st}\,dt = \int_0^\infty y_1e^{-st}\,dt+\int_0^\infty y_2e^{-st}\,dt = \mathscr{L}[y_1]+\mathscr{L}[y_2].$$

Hence, we see $\mathscr{L}[y_1 + y_2] = \mathscr{L}[y_1] + \mathscr{L}[y_2]$.

2 Exam 1 material

All questions on the exam.

1.1: 2, 3, 5

1.2: 1, 35, 39

1.3: 14, 16, 17

1.4: 1, 5, 6

1.5: 3, 9

1.6: 1, 17, 31, 36

1.7: 3, 5, 11

1.8: 3, 11, 33

1.9: 3, 7, 9

3 Exam 2 material

All questions on the exam.

2.1: 1, 2, 8ab

2.2: 6abd, 11, 15a, 21

2.4: 7, 9, 13

2.3: 2.2: 19; 2.3: 2, 8abd

2.5: N/A

3.1: 6, 28, 34

3.2: 1, 11, 13

3.3: 7, 8, 9

3.4: 1, 5abd, 11