Math 242
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University of South Carolina
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Homework Problems for Chapters 7 and 9

Due: the class meeting following discussion in class

Section	Page	Problems
7.2	285	# 2, 9, 13, 16, 18
7.3	291	# 1, 3, 7, 8, 29
7.4	300	# 2, 5, 14, 25, 28
7.5	308	# 3, 4, 17, 20, 30
7.6	319	# 2, 7, 11, 14, 18
9.3	431	# 1, 3, 6, 10, 15
9.4	438	# 8, 9, 10

Notes

- This is the last homework assignment for the semester! We may not be able to discuss all of these topics, but we will explore as many as time permits.
- The Laplace transform is a powerful mathematical tool that has numerous in engineering mathematics. We will see how Laplace transforms can be used to solve linear ODEs.
- The basic idea is to replace a differential equation with an algebraic equation. It's difficult to describe in words; once you see the method, you'll quickly understand the concept. Maple will be used to simplify the algebra, in particular the partial fractions, that is the most tedious part of the problem.
- Laplace transforms require much practice. I have tried to keep the number of problems to a minimum. If you understand the concepts, and know the different properties of Laplace transforms, then most of the assigned problems should not present too much difficulty.
- The most complicated part of Laplace transforms is the partial fraction expansion. I suggest using Maple for this. Recall that if `f` is a Maple expression in the variable `s`, then the command `convert(f,parfrac,s)` will return the partial fraction expansion of `f`. From here, it is usually possible to immediately identify the inverse Laplace transform.
- After we have some familiarity with Laplace transforms, we will take a couple days to discuss the use of Laplace transforms for systems of ODEs. We will also see a few applications of such equations. This is the material from Chapter 9.
- *I do not recommend the memorization of any formulas!* The table of Laplace transforms on the back of this assignment will be provided on the exam.
- The last hour exam will be given on Monday, April 24. This exam will concentrate on the material in Chapters 5 and 7.
- The final exam will be given on Wednesday, May 3 at 9:00AM. While this exam is comprehensive there will be a heavy emphasis on Laplace transforms, modelling, and applications.

Table of Laplace Transforms

$f(t) = \mathcal{L}^{-1}\{F\}(t)$	$F(s) = \mathcal{L}\{f\}(s)$
1	$\frac{1}{s}$
e^{at}	$\frac{1}{s-a}$
t^n	$\frac{n!}{s^{n+1}}$
$\sin bt$	$\frac{b}{s^2+b^2}$
$\cos bt$	$\frac{s}{s^2+b^2}$
$e^{at}f(t)$	$F(s-a)$
$t^n e^{at}$	$\frac{n!}{(s-a)^{n+1}}$
$e^{at}\sin bt$	$\frac{b}{(s-a)^2+b^2}$
$e^{at}\cos bt$	$\frac{s-a}{(s-a)^2+b^2}$
$f'(t)$	$sF(s) - f(0)$
$f^{(n)}(t)$	$s^nF(s) - s^{n-1}f(0) - s^{n-2}f'(0) - \cdots - sf^{n-2}(0) - f^{n-1}(0)$

Note: n is a positive integer.