Name:_____   Lecure Section ___

Ma 221   Exam IIIB   05F

Name: Lecture Section:

I pledge my honor that I have abided by the Stevens Honor System.

_____

You may not use a calculator, cell phone, or computer while taking this exam. All work must be shown to obtain full credit. Credit will not be given for work not reasonably supported. When you finish, be sure to sign the pledge.

Score on Problem #1 _____

                          #2 _____

                          #3 _____

                          #4 _____

Total Score   _____

Note: A table of Laplace Transforms is given at the end of the exam.

1 $\left(25\ \textbf{pts}.\right)$ Use Laplace Transforms to solve

$$y'' - y = -e^{-2t} \quad y(0) = 0 \ \ y'(0) = 1$$

2a (**10 pts.**)   Use the definition of the Laplace transform to find $\mathcal{L}\{3t\}$. Assume $s > 0$.

2b $\left(15\ \textbf{pts.}\right)$ Find $\mathcal{L}^{-1}\left\{\dfrac{s-2}{s^2-6s+15}\right\}$.

3 $\left(25\ \textbf{pts.}\right)$ Find the first <u>six</u> non-zero terms in the series solution near $x = 0$ of the equation

$$y'' - xy' + 3y = 0$$

Give the recurrence relation also.

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4 $\left(25 \text{ pts.}\right)$ Find the eigenvalues and eigenfunctions for

$$y'' + \lambda y = 0 \quad y'(0) = y(\pi) = 0$$

Be sure to consider all values of λ.

Table of Laplace Transforms

$f(t)$	$F(s) = \mathcal{L}\{f\}(s)$		
$\dfrac{t^{n-1}}{(n-1)!}$	$\dfrac{1}{s^{n}}$	$n \geq 1$	$s > 0$
e^{at}	$\dfrac{1}{s-a}$		$s > a$
$\sin bt$	$\dfrac{b}{s^2 + b^2}$		$s > a$
$\cos bt$	$\dfrac{s}{s^2 + b^2}$		$s > a$
$e^{at}f(t)$	$\mathcal{L}\{f\}(s-a)$		
$t^{n}f(t)$	$(-1)^{n}\dfrac{d^{n}}{ds^{n}}(\mathcal{L}\{f\}(s))$		