Some Additional Review Problems from the Textbook

This is not an exhaustive list of all possible type of problems.
Answers and solutions to odd exercises are in the book and Student Solutions Manual, respectively.
(For more problems, see your class notes, examples in the book and homework problems.)

Section	Problems	Section	Problems
1.1	1-11 (odd)	6.1	3, 9, 15, 19
1.2	5, 7, 9, 15, 25	6.2	1, 5, 9, 13, 17
1.3	3, 5, 13	6.3	1, 5, 7, 31 (Not annihilator method)
2.2	1, 5, 11, 13, 27(a), 29	6.4	1, 5, 7
2.3	1, 3, 11, 21, 25(a)	Page 343	1(a), 2(c), 3, 5(a), 7(a), 9
2.4	1, 3, 7, 11, 19, 23	7.2	7, 11, 13, 17, 23, 29(a, b)
2.5	1, 3, 7, 9	7.3	3, 5, 7, 15, 21
Page 77	1, 3, 5, 7, 13, 19, 25, 29, 31, 35, 41	7.4	3, 5, 9, 21, 25
3.2	1, 3, 9, 13, 21	7.5	1, 3, 5, 7, 29
3.4	1, 5, 11, 13	7.6	5*, 7*, 11, 15, 29, 33, 35 * Use unit step functions
4.2	9, 17, 19, 27, 29	7.8	5, 9, 13, 17, 21
4.3	5, 17, 21, 23	Page 416	1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25
4.4	1, 3, 7, 13, 17, 27, 31	8.1	5, 13
4.5	1(a), 7, 9, 15, 21, 25, 27, 35	8.2	1, 9, 11, 19, 21, 23, 27, 29, 31
4.6	1, 7, 11, 15	8.3	1, 5, 7, 15, 17, 21, 27
4.7	1, 5, 37, 38, 45, 47	8.4	3, 9, 17, 21
4.9	1, 7, 9	8.5	3, 5, 9, 11, 13, 15
4.10	3, 9, 11	Page 491	1, 3, 5, 6
Page 233	1, 3, 5, 7, 9, 13, 15, 17, 19, 21, 23, 25, 29, 31, 33, 39		

Ordinary Differential Equations

Math 2280

Sample Exam II

Sections 4.4-4.9, 7.1-7.6 & 7.8

Time Limit: 2 Hours No Scratch Paper 5 Pages

Calculator: Any without a Computer Algebra System

Name:____________________________

The point value of each problem is in the left-hand margin. You must show your work to receive any credit, except in problems 1 and 2. Work neatly.

(4) 1. Fill in the blanks.

(a) The particular solution of $y'' + 2y' + y = e^{-x}$ is of the form $y_p(x) =$ ____________ .

(b) $\mathscr{L}^{-1}\left\{\dfrac{s+10}{s^2+4}\right\} = \cos 2t$ ____________ .

(15) 2. Find the solution of the initial value problem $y'' + y' = 2\sin t$, $y(0) = 0$, $y'(0) = 0$.

(10) 3. Find the solution of the initial value problem $y'' + y = \tan t$, $y(0) = 0$, $y'(0) = 0$.

(10) 4. One solution of the differential equation $2\,t^2\,y'' + 3\,t\,y' - y = 0$, $t > 0$, is $y_1(t) = \frac{1}{t}$. Find a second solution, y_2, of it such that y_1 and y_2 are linearly independent.

(12) 5. A spring-mass-dashpot system has a mass of $1\,kg$ and its damping constant is $0.2\,\frac{N-Sec}{m}$. This mass can stretch the spring (without the dashpot) $9.8\,cm$. If the mass is pushed downward from its equilibrium position with a velocity of $1\,m/sec$, when will it attain its maximum displacement below its equilibrium?

(7) 6. Find the Laplace transform of $f(t) = \begin{cases} e^t & , 0 \leq t < 1 \\ 1 & , t \geq 1 \end{cases}$ using the Definition of the Laplace transform. Hint: Consider cases: $s < 0$, $s = 0$, $s = 1$ and $s > 0$ but $s \neq 1$.

(8) 7. Find the inverse Laplace transform of $G(s) = \dfrac{3s^2 + 5s + 17}{(s^2+4)(s+1)}$.

(10) 8. Solve $y'' + 4y' + 4y = t^2$, $y(0) = y'(0) = 0$, using the method of Laplace transform.

(12) 9. Solve the initial value problem $y'' + y = \delta(t-2)$, $y(0) = 0$, $y'(0) = 1$.

Brief Table of Laplace Transforms

$f(t) = \mathscr{L}^{-1}\{F(s)\}$	$F(s) = \mathscr{L}\{f(t)\}$
1	$\dfrac{1}{s}\,,\ s > 0$
e^{at}	$\dfrac{1}{s-a}\,,\ s > a$
$t^n\,,\ n = 1,\, 2,\, \cdots$	$\dfrac{n!}{s^{n+1}}\,,\ s > 0$
$\sin bt$	$\dfrac{b}{s^2+b^2}\,,\ s > 0$
$\cos bt$	$\dfrac{s}{s^2+b^2}\,,\ s > 0$
$e^{at}f(t)$	$F(s-a)$
$e^{at}\sin bt$	$\dfrac{b}{(s-a)^2+b^2}\,,\ s > a$
$e^{at}\cos bt$	$\dfrac{s-a}{(s-a)^2+b^2}\,,\ s > a$
$t^n e^{at}\,,\ n = 1,\, 2,\, \cdots$	$\dfrac{n!}{(s-a)^{n+1}}\,,\ s > a$
$f(at)\,,\ a > 0$	$\dfrac{1}{a}F\left(\dfrac{s}{a}\right)$
$u(t-a)\,,\ a \geq 0$	$\dfrac{e^{-as}}{s}\,,\ s > 0$
$u(t-a)f(t-a)\,,\ a \geq 0$	$e^{-as}F(s)$
$u(t-a)g(t)\,,\ a \geq 0$	$e^{-as}\mathscr{L}\{g(t+a)\}(s)$
$\delta(t-a)\,,\ a \geq 0$	e^{-as}
$\delta(t-a)f(t)\,,\ a \geq 0$	$e^{-as}f(a)$
$c\,f(t)$	$c\,F(s)$
$f(t)+g(t)$	$F(s)+G(s)\,,$ where $G(s) = \mathscr{L}\{g(t)\}$
$f'(t)$	$sF(s) - f(0)$
$f''(t)$	$s^2F(s) - sf(0) - f'(0)$
$f^{(n)}(t)$	$s^nF(s) - s^{n-1}f(0) - \cdots - sf^{(n-2)}(0) - f^{(n-1)}(0)$