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 I
Sections 1.1-1.3, 2.1-2.5, 3.1, 3.2, 3.4 & 4.1-4.3
Time Limit: 2 Hours[1]   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.

(6) 1. True or false.

(   ) (a) The equation $5\,y' + 2x\,y^2 = 1$ is a linear ordinary differential equation.

(   ) (b) $y = e^{2x}$ is a solution of the ODE $y'' - y' + y = 3\,e^{2x}$.

(   ) (c) Functions $f(x) = 2x - 1$ and $g(x) = 5x - \frac{5}{2}$ are linearly independent on $(-\infty,\ \infty)$.

(6) 2. Fill in the blanks.

(a) The ODE $M(x,\ y) + N(x,\ y)\,\frac{dy}{dx} = 0$ is called exact if   .

(b) The integrating factor for the linear ODE $y' + P(x)y = Q(x)$ is   .

(b) The general solution of $y'' + 2y' + y = 0$ is   .

(12) 3. Find the solution of $2y'' + 3y' - 2y = 0$, $y(0) = 5$, $y'(0) = 0$.

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(8) 4. Show that the IVP $\frac{dy}{dx} = 1 + x\,y^{\frac{1}{2}}$, $y(0) = 2$ has a unique solution.

(12) 5. Find the explicit solution of $x\,y' = x \sin x - y$, $x > 2$.

(14) 6. A 200-gallon tank contains 100 gallons of water with 10 pounds of salt in solution. Water containing 2 pounds of salt per gallon is allowed to enter the tank at the rate of 3 gallons per minute, and the well-mixed solution flows out at the rate of 3 gallons per minute. Find the amount of salt in the tank in one hour.

(14) 7. A body of mass $10\,kg$ is thrown downward with the initial velocity of $20\,m/sec$, in a medium offering resistance twice the square of the velocity. Find its velocity at any time t and determine its limiting velocity (if it exists). Note: Clearly show the derivation of your differential equation!

(10) 8. Find the general solution of $3y'' + 2y' + y = 0$.

(12) 9. Find the general solution of the differential equation $(y^4 - 3xy) + (2xy^3 - x^2)\frac{dy}{dx} = 0$.

(6) 10. Find the Wronskian of functions $y_1(t) = e^{-t}$ and $y_2(t) = t^2\, e^t$.