Review for Midterm I

Midterm 1 will be on March 2. The sections covered are : $1.1, 1.2, 1.4, 1.5, 1.6, 3.1, 3.2, 3.3, 3.5, 3.8, 4.1$. I have written some review problems here.

i) Find the general solution of the differential equation :

   a) $xy' - y = 2x^2y$
   b) $xy' = 2y + x^3 \cos x$
   c) $x^2y' = xy + x^2e^{y/x}$
   d) $(2xy^2 + 3x^2)dx + (2x^2y + 4y^3)dy = 0$

ii) Find the solution to the initial value problems :

   a) $xy' - 3y = x^3; y(1) = 0$
   b) $y^{(4)} - 4y'' = x^2; y(0) = y'(0) = 1, y''(0) = y^{(3)}(0) = -1$
   c) $y'' - 6y' + 25y = 0; y(0) = 3, y'(0) = 1$
   d) $y'' + 2y' + 2y = \sin(3x); y(0) = 2, y'(0) = 0$

iii) Determine whether $\lambda = 0$ is an eigenvalue and then find the positive eigenvalues and associated eigenfunctions of $y'' + \lambda y = 0; y'(0) = 0, y(1) = 0$.

iv) Solve the system of differential equations $x' = -2y, y' = 2x; x(0) = 1, y(0) = 0$.

I would also suggest that you try some more problems from the book that are similar to the assigned homework problems. Here are some suggestions :

i) Sec 1.1 : $5-7, 21-24, 36$; Sec 1.2 : $8, 10, 17, 18, 25, 27, 33$; Sec 1.4 : $6-10, 21-23, 37, 39$

ii) Sec 1.5 : $10 - 13, 20 - 22, 35$; Sec 1.6 : $5 - 7, 13, 14, 20, 35, 36, 47 - 50$;

iii) Sec 3.1 : $5-8, 25, 35-38, 48$; Sec 3.2 : $4, 5, 11, 15-17, 21$; Sec 3.3 : $7-9, 24, 31, 34, 39$

iv) Sec 3.5 : $10 - 13, 23, 27, 36 - 38, 55, 56$