Math 217, Spring 2013
Assignment 2

1. Find the general solutions of the following ODEs.

   (a) $y' + y = e^{3x}$;

   (b) $x^2y' + x(x+2)y = e^x$;

   (c) $\frac{dr}{d\theta} + r\sec\theta = \cos\theta$;

   (d) $(x^2-1)y' + 2y = (x+1)^2$.

2. Solve the following IVPs.

   (a) $\frac{dy}{dx} = 2x - 3y, \quad y(0) = \frac{1}{3}$;

   (b) $xy' + y = e^x, \quad y(1) = 2$.

3. (a) §2.4, Problem 10;
   (b) §2.4, Problem 17;
   (c) §2.4, Problem 21;
   (d) §2.4, Problem 22.

4. Verify that the given functions form a fundamental set of solutions of the differential equation. Form the general solution.

   (a) $y'' - 4y = 0; \qquad \cosh 2x, \quad \sinh 2x$

   (b) $x^3y''' + 6x^2y'' + 4xy' - 4y = 0, \qquad x, \quad , x^{-2}, \quad x^{-2}\ln x$

   Hint. $\sinh x = \frac{e^x - e^{-x}}{2}$ and $\cosh x = \frac{e^x + e^{-x}}{2}$.

5. Show that the indicated function $y_1(x)$ is a solution of the given differential equation. Use reduction of order, to find a second solution $y_2(x)$.

   (a) $y'' + y = 0;$ $\qquad y_1 = \sin x$

   (b) $xy'' + y' = 0;$ $\qquad y_1 = \ln x$

   (c) $(1 - 2x - x^2)y'' + 2(1 + x)y' - 2y = 0;$ $\qquad y_1 = x + 1$

6. Find the general solution of the given differential equations.

   (a) $y'' - y' - 6y = 0$

   (b) $y'' - 10y' + 25y = 0$

   (c) $3y'' + 2y' + y = 0$

   (d) $y''' + 3y'' - 4y' - 12y = 0$

   (e) $y^{(4)} - y = 0$

7. Solve the given differential equation by undetermined coefficients.

   (a) $y'' + y' - 6y = 2x$

   (b) $y'' + 3y = 48x^2e^{3x}$

   (c) $y'' - 2y' + y = 2\cosh x$

   (d) $y''' - 2y'' - 4y' + 8y = 6xe^{2x}$