Math 212
Exam 2 Due 4/10/18 Name: _____

1. Determine the general solution of each of the following differential equations.
   (a) $y'' + 2y' + 5y = e^{-x} \sec 2x$
   (b) $2y'' + 3y' + y = x^2 + 3 \sin x$
   (c) $y'' + 2y' + y = e^{-x} \ln x$

2. Given that $y_1(x) = \sin(x^2)$ is one solution of
$$xy'' - y' + 4x^3 y = 0 ,$$
determine the general solution of this ODE.

3. Consider the ODE
$$y'' - xy = 0 .$$
   (a) Determine the Maclaurin series for two independent solutions of this ODE. For each of these solutions, obtain a nice, compact formula for the coefficients.
   (b) Using the formulas obtained in part (a), apply the ratio test to determine the values of x for which these Maclaurin series converge.

4. Determine the first 4 nonzero terms of the Maclaurin series of two independent solutions of the ODE
$$\left(3 - x^2\right) y'' - 3xy' - y = 0 .$$

5. Apply the method of Frobenius to determine the first four nonzero terms of the power series expansions of two independent solutions of the ODE
$$2xy'' + (x + 1) y' + 3y = 0 .$$