Math 46, Final Exam
Monday, 12/06/10, 7 PM – 10 PM.

Name:________________________

- This is a closed book exam. The total points are 100 points.
- In each problem, you have to show every step of your calculation.
- Calculator is not allowed in the exam.

1. (10 points) Find the solution of $3y'' + y + 2\frac{x^2}{y}e^{-x} = 0$ with $y(0) = 2010$.

2. (10 points) Solve the differential equation
   
   $$y'' - 6y' + 9y = 0.$$ 

3. (10 points) Solve the equation:
   
   $$x^2y' = yx + y^2.$$ 

4. (10 points) Solve the initial value problem:
   
   $$y'' - 4y' + 3y = 0, \quad y(0) = y'(0) = 2$$

5. (10 points) Solve the initial value problem:
   
   $$y'' - 4y = e^x, \quad y(0) = 0, \quad y'(0) = 0.$$ 

6. (10 points) Find two linearly independent solutions of the differential equation
   
   $$y'' - 4y' + 8y = 0.$$ 

7. (10 points) Solve the following equation
   
   $$x^2y'' - 2xy' + 2y = 46,$$

   with knowing two solutions $y_1 = x$ and $y_2 = x^2$ of its homogeneous equation.

8. (10 points) Find the general solution of equation
   
   $$(x - y\cos x)dx - (\sin x + e^y)dy = 0.$$ 

9. (10 points) Find a particular solution of
   
   $$y'' - 4y' + 4y = xe^{2x}.$$ 

10. (10 points) Solve the following initial value problem

    $$4y'' - 4y' + y = 46, \quad y(0) = 1, \quad y'(0) = 0.$$