EXAM

Exam 2

Math 3350, Spring 2009

April 2, 2009

- Write all of your answers on separate sheets of paper. You can keep the exam questions when you leave. You may leave when finished.
- You **must** show enough work to justify your answers. Unless otherwise instructed, give exact answers, not approximations (e.g., $\sqrt{2}$, not 1.414).
- This exam has 5 problems. There are **270 points total**.

Good luck!

90 pts.

Problem 1. In each part, find the general solution of the differential equation, or solve the initial value problem.

A.

$$y'' - 3y' + 2y = 0, \qquad y(0) = 1, \quad y'(0) = 3.$$

B.

$$y'' + 2y' + y = 0$$

C.

$$y'' - 4y' + 13y = 0.$$

D.

$$x^2y'' - 6y = 0$$

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60 pts.

Problem 2. Find the general solution.

A. $(D-1)(D-2)(D-3)(D+4)y = 0$

B. $D^3(D+1)(D-2)^3y = 0$

C. $(D-2)(D^2-4D+5)^3y = 0$

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40 pts.

Problem 3. **Use the method of Undetermined Coefficients** (either version) to find the general solution

A.

$$y'' - 3y' + 2y = x^2 + 1$$

B.

$$y'' - 3y' + 2y = e^{2x}$$

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40 pts.

Problem 4. Find the general solution **by the method of variation of parameters**. (No credit for doing it by a different method.)

$$x^2y'' + 3xy' - 3y = x.$$

The basic solutions are $y_1 = x$ and $y_2 = 1/x^3$.

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40 pts.

Problem 5. The motion of a weight on a spring, with no damping, is described by the equation

$$\frac{d^2y}{dt^2} + y = 0.$$

Suppose that the initial conditions are $y(0) = -1$ and $y'(0) = 1$.

Find the solution of the initial value problem.

Find the amplitude A of the oscillations. Write the solution in the form

$$y = A\cos(\omega t - \varphi).$$
