Name: _____

4-digit code: _____

- Write your name and the last 4 digits of your SSN in the space provided above.
- The test has four (4) pages, including this one.
- Write the answers in the boxes provided, where applicable.
- Show sufficient work to justify all answers unless otherwise stated in the problem. Correct answers with inconsistent work may not be given credit.
- Credit for each problem is given at the right of each problem number.
- No books, notes or calculators may be used on this test.

Page	**Max**	**Points**
2	35	
3	30	
4	35	
Total	100	

Problem 1 (30 pts)**.** Use the method of **variation of parameters** to solve the initial value problem $y'' + 3y' + 2y = x$ that satisfies $y(0) = 0, y'(0) = \frac{1}{2}$.

$y(x) =$ [ ]

Problem 2 (5pts)**.** Decide whether the functions $y_1(x) = 1 + |x^3|$ and $y_2(x) = 1 + x^3$ are linearly dependent or independent in the interval $(-3, 3)$.

Problem 3 (20 pts)**.** Use exclusively the technique of **undetermined coefficients** to find a general solution of the differential equation $y'' + 3y' + 2y = x$.

$y(x) =$ [ ]

Problem 4 (10pts)**.** Use the Wronskian of the functions $y_1(x) = e^{-3x}$, $y_2(x) = \cos 2x$, and $y_3(x) = \sin 2x$, to prove that they are linearly independent.

$W(y_1, y_2, y_3) =$ [ ]

Problem 5 (15 pts)**.** Find the solution to the differential equation $y'' - 4y' + 5y = 0$ that satisfies $y(0) = 1$ and $y'(0) = 5$.

$y(x) =$ ☐

Problem 6 (20)**.** Find a particular solution y_p to the differential equation $y'' + y = \sin x$.

$y_p(x) =$ ☐