Name: _____

VIP ID: _____

- Write your name and VIP ID 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.

Page	**Max**	**Points**
2	30	
3	30	
4	40	
Total	100	

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

$y(x) =$ $\boxed{}$

Problem 2 (30 pts)**.** Use exclusively the technique of **undetermined coefficients** to find a general solution of the differential equation $y'' + 3y' + 2y = x - 2$.

$y(x) =$ [ ]

Problem 3 (20 pts)**.** Find the solution to the differential equation $y'' - 4y' + 5y = 0$ that satisfies $y(0) = 2$ and $y'(0) = 3$.

$y(x) =$ [ ]

Problem 4 (20)**.** Find a particular solution $Y(x)$ for the differential equation $y'' + y = \cos x$.

$Y(x) =$ [ ]