Show all work for each problem.

1. (15 pts) \( y'' - 2y' + 2y = 2x, \ y(0) = 4, \ y'(0) = 8, \ y_e = c_1 e^x \cos x + c_2 e^x \sin x, \ y_p = x + 1. \)

Find a solution satisfying the given initial conditions.
2. (20 pts) Solve the initial value problem \( y'' - 6y' + 25y = 0 \), \( y(0) = 3 \), \( y'(0) = 1 \).
3. (25 pts) Solve \( y'' - y' - 2y = \cos(2x) \). Be sure to show all work required to find \( y_c \) and \( y_p \).
4. (15 pts) Given the RL circuit equation with no capacitor $L I' + R I = E(t)$, \( L = 2 \) henries, \( R = 40 \) ohms, 
\[ E(t) = 100e^{-10t} \]
and the initial value of the current at time \( t = 0 \) is \( I(0) = 0 \) amperes. Find \( I(t) \).
Solve the problem either by setting it up as a linear first order differential equation and then using an integrating factor, or by solving the given problem using the characteristic equation.
5. (15 pts) Find a general solution of the system \( x' = y, \ y' = 6x - y, \ x(0) = 1, \ y(0) = 2 \).
Show all work for each part of the problem solution.

1. (15 pts) Use the method of variation of parameters to find a particular solution of $y'' - 9y = xe^{-x}$.

Use and evaluate the Wronskian in your solution process. Simplify your results for $y_p$. 

Extra work