Nonhomogeneous Equations: The Methods of Undetermined Coefficients and Variation of Parameters- HW Problems

In problems 1-5 find a particular solution y_p of the given equation.

1. $y'' - y' - 2y = 4x^2$
2. $y'' + 4y' + 13y = 20e^{-x}$
3. $y' - 3y = -4xe^x$
4. $y'' - y' - 2y = -10\cos(x)$
5. $y^{(3)} + y'' = 12x + 4.$

In problems 6-8 solve the initial value problem.

6. $y'' + y' - 2y = -10\sin(x)\,; \quad y(0) = 4, \quad y'(0) = 3.$
7. $y'' - 2y' + 2y = 2x + 1; \quad y(0) = 3, \quad y'(0) = 1.$
8. $y^{(4)} - y^{(3)} = 24x - 6;$
   $y(0) = 4, \quad y'(0) = 6, \quad y''(0) = 6, \quad y^{(3)} = -10.$

In problems 9-11 use the method of variation of parameters to find a particular solution to the differential equation.

9. $y'' - \frac{3}{x}y' + \frac{3}{x^2}y = \frac{1}{x}$; where $y_1 = x$ and $y_2 = x^3$ are solutions to $y'' - \frac{3}{x}y' + \frac{3}{x^2}y = 0.$
10. $y'' - 2y' + y = \frac{e^x}{x}$
11. $y'' + 4y = \sin(2x).$