Worksheet 10

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Solve the differential equation or initial-value problem using the method of undetermined coefficients (and the superposition principle when needed).

1. $y'' + y = e^x + x^3$.
2. $y'' - 4y = e^x \cos(x)$, $y(0) = 1$, $y'(0) = 2$.
3. $y'' - 2y' + y = 8e^t$.
4. $y'' + y' - 12y = e^t + e^{2t} - 1$.
5. $y'' - y' = 1 + e^x$, $y(0) = y(1) = 0$.

Find a particular solution of the differential equation, using the method of undetermined coefficients.

6. $y''' + y'' - 2y = te^t$.
7. $y^{(4)} - 3y'' - 8y = \sin(t)$.
8. Find a form of a particular solution for the differential equation $y''+2y'+2y = 8t^3 e^{-t} \sin(t)$.

Solve the differential equation using the method of variation of parameters.

9. $y'' + y = \sec^3(x)$, $0 < x < \pi/2$.
10. $y'' + 3y' + 2y = \sin(e^x)$.
11. $y'' - 2y' + y = \dfrac{e^x}{1 + x^2}$.

Solve the differential equation using (a) undetermined coefficients and (b) variation of parameters.

12. $y'' - 2y' - 3y = x + 2$.
13. $y'' - y' = e^x$.

Find a particular solution to the variable coefficient equation given that y_1, y_2 are linearly independent solutions to the corresponding homogeneous equation for $t > 0$

14. $ty'' - (t + 1)y' + y = t^2$, $y_1 = e^t$, $y_2 = t + 1$.
15. $ty'' + (1 - 2t)y' + (t - 1)y = te^t$, $y_1 = e^t$, $y_2 = e^t \ln(t)$.