

**MAT 2384-Practice Problems on Nonhomogeneous higher order ODEs-Methods of
Undermined Coefficients and the Variation of Parameters**

For each of the following ODEs, Find the General Solution. If an initial condition is given, find also the corresponding particular solution.

1. $y''' - 2y'' - 4y' + 8y = e^{-3x} + 8x^2$
2. $y''' + 3y'' - 5y' - 39y = 30 \cos x$
3. $y''' + 3y'' - 16y' - 48y = 112e^{4x} + 60e^x$
4. $y^{(4)} + 0.5y'' + 0.0625y = e^{-x} \cos(0.5x)$
5. $x^3y''' + 0.75xy' - 0.75y = 9x^{5.5}$
6. $(D^4 + 10D^2 + 9)y = 13 \left(\frac{e^{2x} + e^{-2x}}{2} \right)$
7. $(D^3 - 2D^2 - 9D + 18)y = e^{2x}$
8. $x^3y''' + 7x^2y'' + xy' - 16y = 9x \ln(x)$
9. $y^{(4)} - 26y'' + 25y = 50(1+x)^2$, $y(0) = 12.16$, $y'(0) = -6$, $y''(0) = 34$, $y'''(0) = -130$
10. $y^{(4)} - 4y''' + 5y'' - 4y' + 4y = 3 \cos(x) + 2xe^{2x}$
11. $y''' - 3y'' + 4y = -2xe^{2x} + \frac{5}{3}e^{2x}$
12. $y''' + 6y'' + 11y' + 6y = \frac{1}{1+e^x}$