**Higher Order Nonhomogeneous Linear ODEs with Constant Coefficients**

Recall the Superposition Principle implies: The general solution $y_g$ for any nonhomogeneous, linear ODE (of any order) with constant coefficients is . . .

The Method of Undetermined Coefficients (again):
Consider the ODE $a_n y^{(n)} + a_{n-1} y^{(n-1)} + \ldots + a_1 y' + a_0 y = f(t)$.

1. If $f(t) = (a$ degree $n$ polynomial$)e^{rt}$, then a particular solution to the ODE has the form $y_p(t) = \ldots$

2. If $f(t) = (a$ degree $n$ polynomial$)e^{at} \cos(\beta t)$ or $f(t) = (a$ degree $n$ polynomial$)e^{at} \sin(\beta t)$, then a particular solution to the ODE has the form $y_p(t) = \ldots$

**Ex 1:** Find the general solution for $y''' + y'' = 3e^t + 4t^2$. 
Ex 2: Find the form of a particular solution to \((D - 2)^3(D^2 + 9)[y] = t^2e^{2t} + t \sin 3t\).

Ex 3: Find the form of a particular solution to

\[(D - 1)^3(D - 2)(D^2 + D + 1)(D^2 + 6D + 10)^3[y] = te^t + e^{-3t} \cos t.\]