A. **Sums.** Consider a sum of forcing terms:

$(\star)$ $y'' + py' + qy = f_1(t) + f_2(t)$

If y_{p1} solves:

$(\star_1)$ $y'' + py' + qy = f_1(t)$

and y_{p2} solves:

$(\star_2)$ $y'' + py' + qy = f_2(t)$

then a solution to $(\star)$ is: $y_p =$

The idea is that:

$(y_{p1}+y_{p2})''+p(y_{p1}+y_{p2})'+q(y_{p1}+y_{p2})$

$=(y''_{p1}+py'_{p1}+qy_{p1})+(y''_{p2}+py'_{p2}+qy_{p2})$

If the forcing term is:

$f(t) = f_1(t) + f_2(t)$

then use trial solution:

$y_p =$

Example 1. Consider the differential equation:

$y'' + 2y' + 5y = 2e^{-t}\cos 2t + 3e^{-t}\sin 2t + t^2 + 2t + 1$

and select an appropriate **real** trial solution. You do not need to solve.

Recall that forcing term:

$f(t) = [\text{poly}]e^{at}\cos bt$ or $[\text{poly}]e^{at}\sin bt$

has real trial solution:

$y_p = t^n([\text{poly}]e^{at}\cos bt + [\text{poly}]e^{at}\sin bt)$

where n is the number of times $\lambda = a + bi$ is a root of the characteristic equation.

We also recall that forcing term:

$f(t) = [\text{poly}] = [\text{poly}]e^{0t}$

has trial solution:

$y_p = t^n[\text{poly}]e^{0t} = t^n[\text{poly}]$

where n is the number of times $\lambda = 0$ is a root of the characteristic equation.