MAT 239 (Differential Equations), Prof. Swift
Worksheet 19, on the Method of Undetermined Coefficients

1. Find the general solution $y(t)$ to $(D-2)^2 y = 0$.

$(r-2)^2=0, r=2,2$ $\quad y = C_1 e^{2t} + C_2 t e^{2t}$

2. Find the general solution $y(t)$ to $(D-1)(D^2+4)y = 0$.

$(r-1)(r^2+4)=0$, $r=1, \pm 2i$ $\quad y = C_1 e^t + C_2 \cos(2t) + C_3 \sin(2t)$

3. Find the form of the particular solution to $(D-2)^2 y = 5e^t + 3\sin(2t)$.

$r=2,2$ $\quad r'=1, \pm 2i$ (NO repeats between r, r'.)

$y = Ae^t + B\cos(2t) + C\sin(2t)$

4. Find the general solution $y(t)$ to $(D^2+4)y = 0$.

$r^2+4=0, r=\pm 2i$ $\quad y = C_1 \cos(2t) + C_2 \sin(2t)$

5. Find the form of the particular solution to $(D^2+4)y = 7e^t - \cos(2t)$.

$r=\pm 2i$ $\quad r'=1, \pm 2i$

Annihilator of $g(t) = 7e^t - \cos(2t)$ is $(D-1)(D^2+4)$

So $(D-1)(D^2+4)(D^2+4)y = 0$

$y = C_1 e^t + C_2 \cos(2t) + C_3 \sin(2t) + C_4 t\cos(2t) + C_5 t\sin(2t)$

These are in $y_h(t)$.

So Rule 2 says

$y_p(t) = Ae^t + Bt\cos(2t) + Ct\sin(2t)$