To solve linear DE $ay'' + by' + cy = g_1 + g_2 + g_3$

**Step 1:** Solve homogeneous version: $ay'' + by' + cy = 0$ implies 
$$ar^2 + br + c = 0$$ implies $y = c_1\phi_1 + c_2\phi_2$.

**Step 2a:** Find one non-homogeneous solution, $y = f_1$, to $ay'' + by' + cy = g_1$
**Step 2b:** Find one non-homogeneous solution, $y = f_2$, to $ay'' + by' + cy = g_2$
**Step 2c:** Find one non-homogeneous solution, $y = f_3$, to $ay'' + by' + cy = g_3$

**Step 3:** Combine all solutions to create the general solution to the non-homogeneous DE:
$$y = c_1\phi_1 + c_2\phi_2 + f_1 + f_2 + f_3$$

**Last step:** If IVP, plug in initial values to find the constants $c_1$ and $c_2$.

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Guess a possible non-homog soln for the following DEs:

Note homogeneous solution to $y'' + 2y' + y = 0$ is 
$y = c_1e^{-t} + c_2te^{-t}$ since $r^2 + 2r + 1 = (r + 1)(r + 1) = 0$

1.) $y'' + 2y' + y = 4e^{2t}$
   
   Guess: ____________________________

2.) $y'' + 2y' + y = 4e^t$
   
   Guess: ____________________________

3.) $y'' + 2y' + y = 4e^{-t}$
   
   Guess: ____________________________
4.) \[ y'' + 2y' + y = t \]
   Guess: 

5.) \[ y'' + 2y' + y = t + 1 \]
   Guess: 

6.) \[ y'' + 2y' + y = 4\sin(2t) \]
   Guess: 

7.) \[ y'' + 2y' + y = 4\sin(2t) + 5\cos(2t) \]
   Guess: 

8.) \[ y'' + 2y' + y = 4\sin(2t) + 5\cos(3t) \]
   Guess for step 2a: 
   Guess for step 2b: 

9.) \[ y'' + 2y' + y = 4\sin(2t) + t + 1 \]
   Guess for step 2a: 
   Guess for step 2b: 

10.) \[ y'' + 2y' + y = 4t\sin(2t) \]
    
    Guess: 

11.) \[ y'' + y = 4\sin(2t) \]
    
    Guess: 

12.) \[ y'' + y = 4\sin(t) \]
    
    Guess: 