2. [12 points] The following problems consider a non-homogeneous second-order linear differential equation $L[y] = g(t)$. Suppose that y_1 and y_2 are solutions to this equation, and that y_3, y_4, and y_5 are solutions to the complementary homogeneous problem $L[y] = 0$.

a. [3 points] Can you say what problem each of the following solve? If so, indicate what it is; if not, write "none." (No explanation necessary.)

i. $y_1 - y_2$

ii. $y_1 - y_3$

iii. $y_1 + y_2 + y_3 + y_4 + y_5$

b. [3 points] Explain how you are able to determine your answers in (a), or why it is not possible to tell.

c. [6 points] The following statements are not guaranteed to be true. Explain why.

i. The solution to the initial problem $L[y] = 0$, $y(0) = y_0$, $y'(0) = v_0$ (for any y_0 and v_0) can be written as $y = c_1y_3 + c_2y_4 + c_3y_5$ for some c_1, c_2, and/or c_3 (where one or more of c_1, c_2, and c_3 may be zero).

ii. Because both y_1 and y_2 satisfy $L[y] = g(t)$, we must have $y_1 = y_2$.