Read each problem **very carefully** before starting to solve it and do only what is asked. Each problem is worth around 5 points. It is necessary to show **all** your work. Correct answers without explanations are worth 0 points. GOOD LUCK!!

1. The entire problem deals with

$$y''' - 2y'' + 4y' - 8y = -16e^{-2t} + 35\sin 3t + 45\cos 3t.$$

   (a) [4 points] Find the complementary solution $y_c(t)$.

   (b) [4 points] Find the particular solution $Y_1(t)$ of the nonhomogeneous equation $y''' - 2y'' + 4y' - 8y = -16e^{-2t}$.

(c) [3 points] Find the particular solution $Y_2(t)$ of the nonhomogeneous equation $y''' - 2y'' + 4y' - 8y = 35\sin 3t + 45\cos 3t$.

(d) [1 point] Synthesize all information deduced in Parts (a)-(c) to write the general solution $y(t)$ of the given nonhomogeneous 3rd-order linear differential equation given initially.