[gex114] Linear inhomogeneous ODE: undetermined parameters I

Consider the linear, inhomogeneous 2^{nd}-order ODE,

$$y'' + 4y = 8\sin(2x).$$

(a) Examine the characteristic polynomial of the homogeneous ODE and identify if the solution is of case #1 (real roots), case #2 (complex roots), or case #3 (repeated roots) [gam8].
(b) Use the DSolve command of Mathematica to find the complementary solution $Y_{\text{c}}(x)$, which is the general solution of the homogeneous ODE and features two integration constants.
(c) Use the DSolve command to find the general solution $y(x)$ of the inhomogeneous ODE.
(d) Extract the particular solution $Y_{\text{p}}(x) = y(x) - Y_{\text{c}}(x)$ from the results of parts (a) and (b).
(e) Determine $Y_{\text{p}}(x)$ by the method of undetermined conatant parameters [gam8] and reconcile the difference with the expression found in part (c).

Solution: