

### Exercise 13

Write a trial solution for the method of undetermined coefficients. Do not determine the coefficients.

$$y'' - y' - 2y = xe^x \cos x$$

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#### Solution

Since the ODE is linear, the general solution can be written as the sum of a complementary solution and a particular solution.

$$y = y_c + y_p$$

The particular solution satisfies the original ODE.

$$y_p'' - y_p' - 2y_p = xe^x \cos x$$

Since the inhomogeneous term is a polynomial of degree 1 multiplied by an exponential function multiplied by cosine, the particular solution is

$$y_p = (Ax + B)e^{-x}(C \cos x + D \sin x).$$