1. Solve the following ODE using Method of Undetermined Coefficients:

\[ y'' - 4y' - 12y = 32e^{2t} \]

**Solution:** The homogeneous problem is:

\[ y'' - 4y' - 12y = 0 \]

And we solve it using the characteristic equation

\[ \lambda^2 - 4\lambda - 12 = 0 \]

\[ (\lambda - 6)(\lambda + 2) = 0 \]

So we have that \( \lambda = -2, 6 \). So the homogeneous solution is

\[ y_h(t) = c_1 e^{-2t} + c_2 e^{6t} \]

Now for the particular solution, we choose \( y_p(t) = Ae^{2t} \). Plugging into the ODE, we have

\[ 4Ae^{2t} - 8Ae^{2t} - 12Ae^{2t} = 32e^{2t} \]

\[ -16Ae^{2t} = 32e^{2t} \]

So we have that \(-16A = 32\) so \( A = -2 \). Then the particular solution is \( y_p(t) = -2e^{2t} \).

So the general solution:

\[ y(t) = y_h(t) + y_p(t) \]

\[ y(t) = c_1 e^{-2t} + c_2 e^{6t} - 2e^{2t} \]