(1) (5 Points) Set up an appropriate particular solution \( y_p \), for the differential equation,

\[
y^{(3)} - y'' - 12y' = x - 2xe^{-3x}
\]

which have complementary function given by;

\[
y_c = C_1 + C_2e^{-3x} + C_3e^{4x}
\]

(Do not determine the values of coefficients).

- (1pt.) Any work
- (2 pt.) Initial guess is true; \((A + Bx) + (C + Dx)e^{-3x}\)
- (2pt.) Multiplying by \(x\) and saying \(y_p = x.(A + Bx) + x.(C + Dx)e^{-3x}\)
  (if student forgets to multiply two of those terms by \(x\), consider giving 1 partial credit for this case)

(2) (5 Points) Solve the initial value problem;

\[
y'' + 4y = 2x; \quad y(0) = 1, \ y'(0) = 2
\]

whose particular solution is given by;

\[
y_p = \frac{x}{2}.
\]

- (2 pt.) Finding \(y_c = c_1\cos2x + c_2\sin2x\)
- (1 pt.) Saying \(y_g = c_1\cos2x + c_2\sin2x + x/2\)
- (2 pt.) Computing \(c_1 = 1\) and \(c_2 = 3/4\) (for each small algebra mistakes, if the rest of it true, you can deduct 1pt)