1. Find an Integrating Factor and solve the following initial value problem:

\[(\cos wx + w\sin wx)dx + e^x dy = 0, \quad y(0) = 2\]

2. Find a general solution of the following equation:

\[y''' - 2y'' - 4y' + 8y = e^{2x}\]

3. Find the function \(f(t)\) if its Laplace transform \(F(s)\) equals:

(a) \(\frac{3}{s^2} \left( \frac{s + 1}{s^2 + 9} \right)\)
(b) \(\ln \left( \frac{s^2 + 3}{(s^2 - 1)} \right)\)

4. \(A = \begin{bmatrix} -5 & 2 \\ 2 & -2 \end{bmatrix}\), Find (a) \(e^A\) (b) \(A^{10}\), by eigenvalue method.

5. Solve the following equation:

\[
\begin{align*}
y_1'' &= 4y_1 + 8y_2, \quad y_1(0) = 8, \quad y_1'(0) = -18 \\
y_2'' &= 5y_1 + y_2, \quad y_2(0) = 5, \quad y_2'(0) = -21
\end{align*}
\]