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Consider the initial-value problem

$$\vec{x}' = \mathbf{A}\vec{x} + \mathbf{F}(t) \quad \text{with} \quad \vec{x}(0) = \begin{bmatrix} 1 \\ 1 \end{bmatrix},$$

where

$$\mathbf{A} = \begin{bmatrix} 3 & -4 \\ 1 & -1 \end{bmatrix} \quad \text{and} \quad \mathbf{F}(t) = e^t \begin{bmatrix} 1 \\ 1 \end{bmatrix}.$$

The assignment:

- (A) Solve the initial-value problem by
- (i) explicitly computing $e^{\mathbf{A}t}$
 - (ii) explicitly using $e^{\mathbf{A}t}$ in the Variation-of-Parameters method
 - (iii) explicitly writing down the general-solution formula for the driven system above
 - (iv) explicitly applying the initial values to the general-solution formula.
- (B) Solve this initial-value problem using the Laplace-Transform method.