Find the general solution to each of the following systems of equations.

1. $\mathbf{X}' = \begin{pmatrix} 1 & -1 \\ 5 & -3 \end{pmatrix} \mathbf{X}$

2. $\mathbf{X}' = \begin{pmatrix} 3 & -4 \\ 1 & -1 \end{pmatrix} \mathbf{X}$

3. $\mathbf{X}' = \begin{pmatrix} 2 & -1 \\ 3 & -2 \end{pmatrix} \mathbf{X} + \begin{pmatrix} e^t \\ t \end{pmatrix}$