Consider the system of differential equations:
\[
\begin{align*}
    x'_1 &= -2x_1 + x_2 - 12, & x_1(0) &= 5 \\
    x'_2 &= 4x_1 + x_2 - 18, & x_2(0) &= 20
\end{align*}
\]

1. Write this in matrix form, \( \mathbf{x}' = \mathbf{A} \mathbf{x} + \mathbf{b} \), and find the steady-state solution, \( \mathbf{x}_{ss} \).

2. Make a change of variables to transform the system into a homogeneous system.
3. Solve the homogeneous system. (Recall from Worksheet 6 that the eigenvalues of $A$ are $\lambda_1 = -3$, $\lambda_2 = 2$, with eigenvectors $v_1 = (-1, 1)$ and $v_2 = (1, 4)$.)

4. Solve the solution to the original system of differential equations, by writing $x = x_h + x_{ss}$.

5. Sketch the phases portrait of the homogeneous system, and the inhomogeneous system. Also sketch the particular solutions satisfying the given initial conditions.