HOMEWORK 11-PART C

Sketch the phase portraits of system $y' = Ay$ by hand. (i.e, No need solving the system. However, I would like you to try to be as precise as you can.)

1 (1) $A = \begin{pmatrix} 8 & 3 \\ -6 & -1 \end{pmatrix}$, (2) $A = \begin{pmatrix} -11 & -5 \\ 10 & 4 \end{pmatrix}$

2 (1) $A = \begin{pmatrix} 2 & -4 \\ 8 & -6 \end{pmatrix}$, (2) $A = \begin{pmatrix} 3 & 2 \\ -4 & -1 \end{pmatrix}$

Let us try to do something on the case where A has a repeated eigenvalue by example. The system $y' = \begin{pmatrix} 1 & 4 \\ -1 & -3 \end{pmatrix}$ has a repeated eigenvalue, $\lambda = -1$, but one dimesional eigenspace containing $v_1 = (2, -1)^T$. And we have the general solution can be written as $y(t) = e^{-t}((c_1 + c_2 t) \begin{pmatrix} 2 \\ -1 \end{pmatrix} + c_2 \begin{pmatrix} 0 \\ \frac{1}{2} \end{pmatrix})$. The question is:

3 Predict the behavior of the solution in the phase plane as $t \to \infty$ and as $t \to -\infty$.