**5.** [15 points] The following considers the solution (x_1, x_2) to a linear system of two first-order constant coefficient equations,

$$\begin{pmatrix} x_1 \\ x_2 \end{pmatrix}' = \mathbf{A} \begin{pmatrix} x_1 \\ x_2 \end{pmatrix}.$$

a. [5 points] If the solutions to this system for two different initial conditions are shown to the right (in both graphs, the solid curve is x_1 and the dashed curve is x_2), sketch the corresponding trajectories in the phase plane. Label each trajectory.
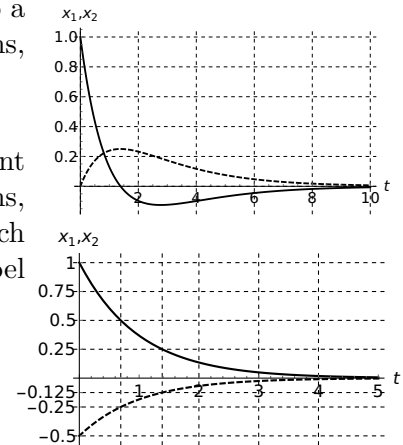
b. [5 points] Given your trajectories in (a), give possible values for the eigenvalues and eigenvectors of the matrix $\mathbf{A}$. Be sure that it is clear how you obtain your answer.

c. [5 points] Sketch a phase portrait for the system given your answer to (b). *(If you were unable to complete (b), assume that your eigenvalues and eigenvectors are $\lambda = -2$ with $\mathbf{v} = \begin{pmatrix} 1 & -1 \end{pmatrix}^T$ and $\lambda = -1$ with $\mathbf{v} = \begin{pmatrix} 2 & -1 \end{pmatrix}^T$.)*