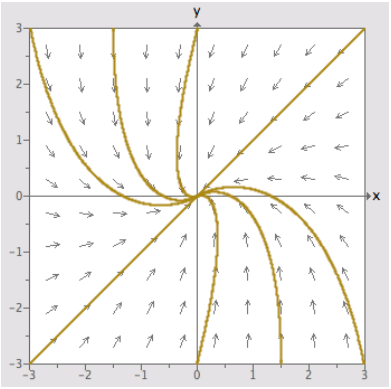
Problem 1: (6 points) For the linear system $\frac{d\mathbf{Y}}{dt} = \mathbf{AY}$ with $\mathbf{A} = \begin{pmatrix} 3 & -2 \\ 2 & 3 \end{pmatrix}$ and $\mathbf{Y} = \begin{pmatrix} x \\ y \end{pmatrix}$, find the solution with $\mathbf{Y}(0) = \begin{pmatrix} 2 \\ 0 \end{pmatrix}$ by completing the following steps.

Part A: (2 points) Compute the eigenvalue(s) of $\mathbf{A}$ and an associated eigenvector for an eigenvalue of $\mathbf{A}$.

Part B: (2 points) Find the solution to $\frac{d\mathbf{Y}}{dt} = \mathbf{AY}$ with $\mathbf{Y}(0) = \begin{pmatrix} 2 \\ 0 \end{pmatrix}$.

Part C: (2 points) Draw a sketch of the phase portrait for the system $\dfrac{d\mathbf{Y}}{dt} = \mathbf{AY}$.

Problem 2: (4 points) Pictured is the phase portrait for a linear system $\dfrac{d\mathbf{Y}}{dt} = \mathbf{AY}$.



What can be said about the eigenvalue(s) of $\mathbf{A}$? What can be said about the associated eigenvector(s)?