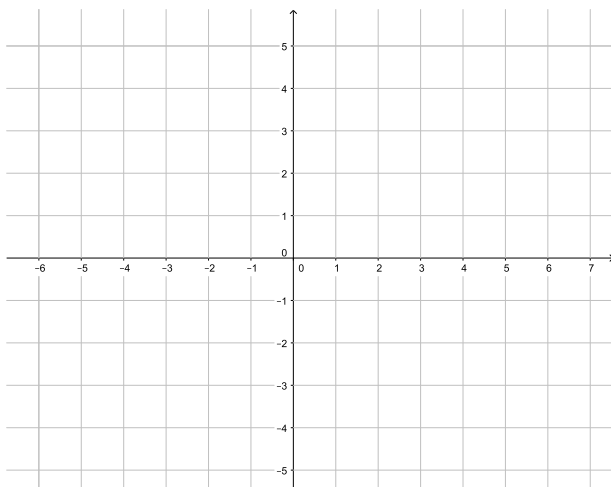


1. (3 points) $\frac{d\vec{u}}{dt} = A\vec{u}(t)$ is a 3 x 3 system of differential equations and the eigenvalues of A are 1, 2, 2 with $N(A - I) = \text{span} \begin{bmatrix} 1 \\ 2 \\ 1 \end{bmatrix}$ and $N(A - 2I) = \text{span} \begin{bmatrix} 1 \\ 0 \\ -1 \end{bmatrix}, \begin{bmatrix} 1 \\ -1 \\ 1 \end{bmatrix}$. Write the general solution for $\vec{u}(t)$.

2. (7 points) Solve $\begin{cases} x' = 2x - 3y \\ y' = 3x + 2y \end{cases}$ and make a phase plane representation of the general solution. Include orientation.



3. (3 points) Make an example of a 2 x 2 homogenous linear system of first order differential equations with repeated but defective eigenvalues. Verify your answer but **do not solve it**.

4. (7 points) Solve $\begin{cases} x' = 3x - 2y \\ y' = 5x - 4y \end{cases}$ and make a phase plane representation of the general solution. Include orientation.

