7. [12 points] Each of the following has an answer that you can determine with minimal work. In each, $\mathbf{A}$ is a 2×2 real-valued matrix (but in each is a different matrix). Provide the answer, and give a two sentence explanation of how you obtained it.

a. [4 points] If $\mathbf{A}\begin{pmatrix}1\\2\end{pmatrix} = \begin{pmatrix}3\\4\end{pmatrix}$ and eigenvalues of $\mathbf{A}$ are λ_1 and λ_2, with corresponding eigenvectors $\mathbf{v}_1$ and $\mathbf{v}_2$, then the general solution to $\mathbf{x}' = \mathbf{A}\mathbf{x} + \begin{pmatrix}3\\4\end{pmatrix}$ is

b. [4 points] If the only eigenvalue of $\mathbf{A}$ is $\lambda = -3$, with only one eigenvector, $\mathbf{v} = \begin{pmatrix}4\\3\end{pmatrix}$, then as $t \to \infty$, the largest term in all solutions of $\mathbf{x}' = \mathbf{A}\mathbf{x}$ will be

c. [4 points] If the eigenvalues of $\mathbf{A}$ are $\lambda = -3$ and $\lambda = 5$, with eigenvectors $\mathbf{v} = \begin{pmatrix}1\\1\end{pmatrix}$ and $\mathbf{v} = \begin{pmatrix}-1\\1\end{pmatrix}$, then the number of solutions $\mathbf{x}$ to $\mathbf{A}\mathbf{x} = \mathbf{0}$ is

and the number of solutions to $\mathbf{A}\mathbf{x} = 3\mathbf{x}$ is