HOMEWORK #1
Due: January 20, 2021

Determine the eigenvalues and eigenvectors (real solutions), (b) sketch the behavior and classify the behavior.

1. $\vec{x}' = \begin{pmatrix} 2 & -5 \\ 1 & -2 \end{pmatrix} \vec{x}$

2. $\vec{x}' = \begin{pmatrix} -1 & -1 \\ 0 & -0.25 \end{pmatrix} \vec{x}$

3. $\vec{x}' = \begin{pmatrix} 3 & -4 \\ 1 & -1 \end{pmatrix} \vec{x}$

4. $\vec{x}' = \begin{pmatrix} 2 & -5/2 \\ 9/5 & -1 \end{pmatrix} \vec{x}$

5. $\vec{x}' = \begin{pmatrix} 2 & -1 \\ 3 & -2 \end{pmatrix} \vec{x}$

6. $\vec{x}' = \begin{pmatrix} 1 & \sqrt{3} \\ \sqrt{3} & -1 \end{pmatrix} \vec{x}$

7. $\vec{x}' = \begin{pmatrix} 3 & -2 \\ 2 & -2 \end{pmatrix} \vec{x}$

8. Consider $x' = -(x-y)(1-x-y)$ and $y' = x(2+y)$ and plot the solutions. Verify your qualitative dynamics with MATLAB/Python/fortran.

9. Consider $x' = x - y^2$ and $y' = y - x^2$ and plot the solutions. Verify your qualitative dynamics with MATLAB/Python/fortran.

10. Consider $x' = (2+x)(y-x)$ and $y' = (4-x)(y+x)$ and plot the solutions. Verify your qualitative dynamics with MATLAB/Python/fortran.