## Differential Equations Seminar: Week 3 Exercises

For each of the following matrices $A$, classify the equilibrium point of the system $\mathbf{x}^{\prime}=A \mathbf{x}$ (i.e. state whether the origin is asymptotically stable, stable, or unstable, and label the origin as a nodal source, saddle, center, spiral sink, etc). Feel free to use Mathematica to help with eigenvalues/eigenvectors or phase plane portraits.

1. $A=\left(\begin{array}{cc}8 & 20 \\ -4 & -8\end{array}\right)$.
2. $A=\left(\begin{array}{ll}2 & -4 \\ 8 & -6\end{array}\right)$.
3. $A=\left(\begin{array}{cc}-11 & -5 \\ 10 & 4\end{array}\right)$.
4. $A=\left(\begin{array}{cc}-7 & 10 \\ -5 & 8\end{array}\right)$.
5. $A=\left(\begin{array}{cc}3 & 2 \\ -4 & -1\end{array}\right)$.
6. $A=\left(\begin{array}{cc}-4 & 10 \\ -2 & 4\end{array}\right)$.
