Math 322 ASSIGNMENT 17, SPRING 2013 **Due at 3 PM Monday May 13th**

For each system given, do each of the following.

(a) Use Wolfram Alpha to find the eigenvalues and eigenvectors.

(b) Draw the phase portrait using only the eigenvalues and eigenvectors. *Then check your answer with the online phase plane plotter.*

(c) Tell whether the origin is a nodal sink or source, spiral sink or source, saddle point or center. If it is a nodal sink or source, tell whether the node is proper, improper or neither.

(d) Tell whether the origin is unstable, asymptotically stable, or neutrally stable.

1. $\mathbf{x}' = \begin{bmatrix} 5 & -1 \\ 3 & 1 \end{bmatrix} \mathbf{x}$

2. $\mathbf{x}' = \begin{bmatrix} 2 & -1 \\ 3 & -2 \end{bmatrix} \mathbf{x}$

3. $\mathbf{x}' = \begin{bmatrix} 1 & -4 \\ 4 & -7 \end{bmatrix} \mathbf{x}$

4. $\mathbf{x}' = \begin{bmatrix} 1 & -5 \\ 1 & -3 \end{bmatrix} \mathbf{x}$

5. $\mathbf{x}' = \begin{bmatrix} 2 & -5 \\ 1 & -2 \end{bmatrix} \mathbf{x}$

6. $\mathbf{x}' = \begin{bmatrix} 3 & -2 \\ 4 & -1 \end{bmatrix} \mathbf{x}$

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