

## HOMEWORK ASSIGNMENT 8

*Due Tuesday April 1, 2008 in class (no kidding!)*

- (1) Find the general solutions to the following non-homogeneous linear

systems of differential equations:

$$(a) \begin{cases} \dot{x} = 4x - 3y + \sin t \\ \dot{y} = 2x - y - 2 \cos t \end{cases}$$

$$(b) \begin{cases} \dot{x} = x - y + 8t \\ \dot{y} = 5x - y \end{cases}$$

$$(c) \begin{cases} \dot{x} = -4x - 2y + \frac{2}{e^t - 1} \\ \dot{y} = 6x + 3y - \frac{3}{e^t - 1} \end{cases}$$

$$(d) \begin{cases} \dot{x} = 3x - 2y \\ \dot{y} = 2x - y + 15e^t \sqrt{t} \end{cases}$$

- (2) Draw the phase portraits for the linear systems of differential equations  $\dot{\mathbf{u}}(\mathbf{t}) = A\mathbf{u}(\mathbf{t})$ . Don't forget to indicate the direction of the trajectories, and the orientation for the degenerate sources/sinks and the foci.

$$(a) \begin{pmatrix} 3 & 4 \\ 2 & 1 \end{pmatrix}, (b) \begin{pmatrix} 2 & -3 \\ 1 & -4 \end{pmatrix} (c) \begin{pmatrix} 2 & 3 \\ 1 & 4 \end{pmatrix} (d) \begin{pmatrix} 3 & -4 \\ 1 & -2 \end{pmatrix}$$

$$(e) \begin{pmatrix} 1 & -1 \\ 2 & -1 \end{pmatrix} (f) \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} (g) \begin{pmatrix} 3 & -2 \\ 4 & -1 \end{pmatrix} (h) \begin{pmatrix} 2 & -1 \\ 1 & 0 \end{pmatrix}$$

$$(k) \begin{pmatrix} 1 & 3 \\ -6 & -5 \end{pmatrix} (l) \begin{pmatrix} -2 & -5 \\ 2 & 2 \end{pmatrix} (m) \begin{pmatrix} 3 & 1 \\ -1 & 1 \end{pmatrix}$$