

MATH 246 Groupwork 3.6 & 3.7**Name:** _____

1. For each of the following the eigenvalues and eigenvectors are given. For each, sketch a reasonable family of solutions and then trace the specific solution with initial value $\bar{x}(0) = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$.

(a) $\bar{x}' = \begin{bmatrix} -3 & 0 \\ 0 & -3 \end{bmatrix} \bar{x}$ has $\left\{ -3, \begin{bmatrix} 1 \\ 0 \end{bmatrix} \right\}$ and $\left\{ -3, \begin{bmatrix} 0 \\ 1 \end{bmatrix} \right\}$.

(b) $\bar{x}' = \begin{bmatrix} 4 & 2 \\ 0 & 4 \end{bmatrix} \bar{x}$ has $\left\{ 4, \begin{bmatrix} 1 \\ 0 \end{bmatrix} \right\}$.

2. Sketch solutions to the Hamiltonian system:

$$\begin{aligned} x' &= 2 - y \\ y' &= 4 - x^2 \end{aligned}$$

Hint: Here we have $H(x, y) = \frac{1}{3}x^3 - 4x + 2y - \frac{1}{2}y^2$ and stationary points $(\pm 2, 2)$.

3. Sketch solutions to the Hamiltonian system:

$$x' = y$$

$$y' = 2x - x^3$$