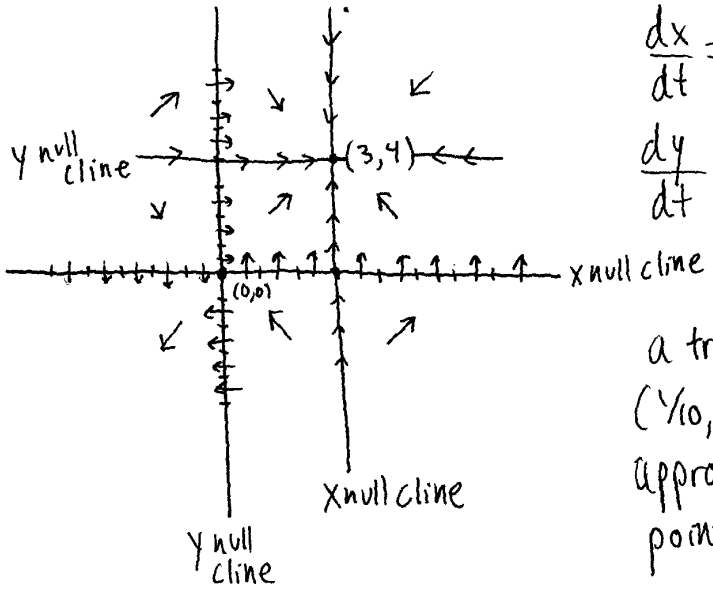
Homework 4 p.125-126

1.



$\frac{dx}{dt} = 3y - xy = (3-x)y$

$\frac{dy}{dt} = 4x - xy = (4-y)x$

a trajectory starting at $(1/10, 1/10)$ at time 0 will approach the equilibrium point $(3,4)$

5. a) $v(t) = \begin{pmatrix} \cos(2t) \\ 3e^{-2t} \end{pmatrix}$

$\frac{dv}{dt} = \begin{pmatrix} -2\sin 2t \\ -6e^{-2t} \end{pmatrix}$

b) $v(t) = \begin{pmatrix} e^{2t} \\ t^2 \end{pmatrix}$

$\frac{dv}{dt} = \begin{pmatrix} 2e^{2t} \\ 2t \end{pmatrix}$

c) $v(t) = \begin{pmatrix} 3 \\ 1 \end{pmatrix}$

$\frac{dv}{dt} = \begin{pmatrix} 0 \\ 0 \end{pmatrix}$

d) $v(t) = \begin{pmatrix} -\sin(t) \\ 2t \end{pmatrix}$

$\frac{dv}{dt} = \begin{pmatrix} -\cos t \\ 2 \end{pmatrix}$

6. a) $\int v(t)\,dt = \begin{pmatrix} \frac{1}{2}\sin 2t \\ -\frac{3}{2}e^{-2t} \end{pmatrix} + \vec{c}$

b) $\int v(t)\,dt = \begin{pmatrix} \frac{1}{2}e^{2t} \\ \frac{1}{3}t^3 \end{pmatrix} + \vec{c}$

c) $\int v(t)\,dt = \begin{pmatrix} 3t \\ t \end{pmatrix} + \vec{c}$

d) $\int v(t)\,dt = \begin{pmatrix} \cos t \\ t^2 \end{pmatrix} + \vec{c}$