

Assignment 6 answers

1. $z = -6y + 9\pi - 3$

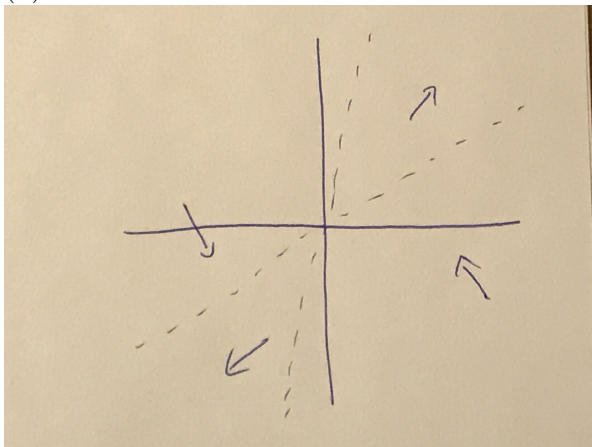
2. $12 + 2e^3$

3. (a) $\lambda = -3, \vec{u} = \begin{bmatrix} -\frac{1}{2} \\ 1 \end{bmatrix} r, r \in \mathbb{R}, r \neq 0.$

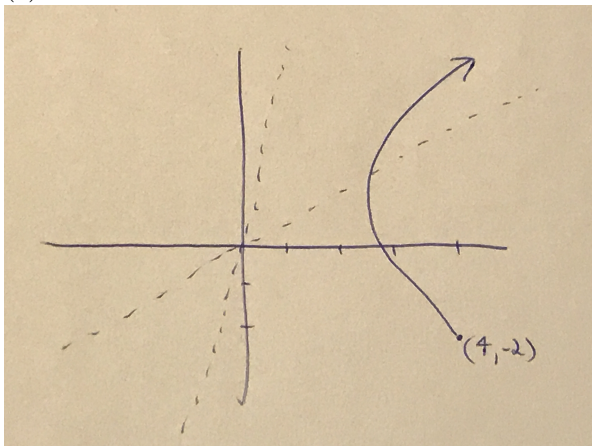
(b) $\lambda = 1, \vec{v} = \begin{bmatrix} \frac{1}{2} \\ 1 \end{bmatrix} s, s \in \mathbb{R}, s \neq 0.$

(c) $\begin{bmatrix} x \\ y \end{bmatrix} = c_1 e^{-3t} \begin{bmatrix} -\frac{1}{2} \\ 1 \end{bmatrix} + c_2 e^t \begin{bmatrix} \frac{1}{2} \\ 1 \end{bmatrix}$

(d)



(e)



(f) Unstable. It's a saddle.

4. (a) $(40, 0)$. (The other equilibrium is not biologically relevant.)

(c) $\lambda = -3, -2.$

(d) $(40, 0)$ is a sink and hence stable.

(e) The x -nullcline is $y = \frac{120}{x} - 3$ (a hyperbola, but we only need the part in the first quadrant). The y -nullclines are $x = 60$ and $y = 0$.

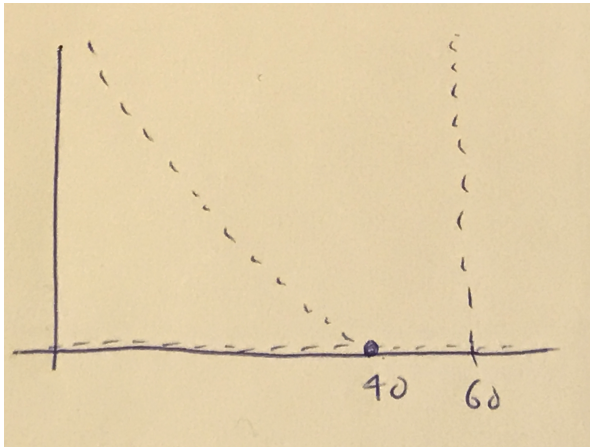
[2]

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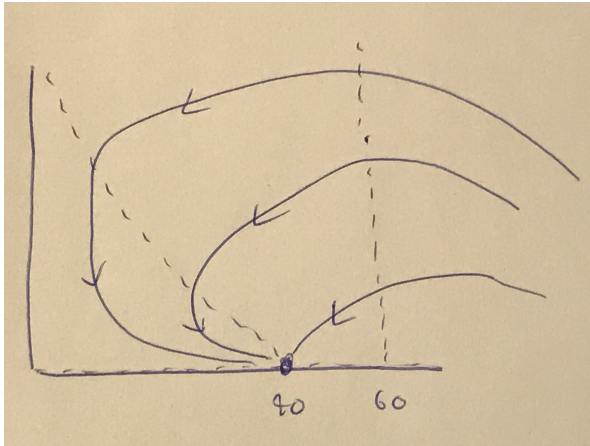
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[2]

(f)



[1]

[Subtract two points for any negative solutions drawn. (Life Sciences penalty)]

(g) Eventually there will be 40 susceptible people and no infected people. This disease will be eradicated.