

HW 18 - Akin Ho

OK to post

3)  $x'(t) = x(t)(1-x(t)-y(t))$

$y'(t) = x(t)(3-2x(t)-y(t))$

$0 = x(1-x-y) \Rightarrow x-x^2-xy = 0 \quad x=0; x+y=1$

$0 = x(3-2x-y) \Rightarrow 3x-6x^2-xy = 0 \quad x=0; 2x+y=3$

$(0,1)$   
 $(0,3)$

$dx = 1-2x-y$

$dy = -x$

$dy = 3-2x-y$

$dy = -x$

$J = \begin{bmatrix} 1-2x-y & -x \\ 3-2x-y & -x \end{bmatrix}$

$J_{(0,1)} = \begin{bmatrix} 0 & 0 \\ 2 & 0 \end{bmatrix}$

$= \begin{bmatrix} -\lambda & 0 \\ 2 & -\lambda \end{bmatrix}$

$\begin{cases} \lambda^2 = 0 \\ \lambda = 0 \end{cases}$   
semistable

~~$J_{(0,3)} = \begin{bmatrix} -2 & 0 \\ 0 & 0 \end{bmatrix} = \begin{bmatrix} -2-\lambda & 0 \\ 0 & -\lambda \end{bmatrix} = 2\lambda + \lambda^2 = \lambda(2+\lambda)$~~

$J_{(0,3)} = \begin{bmatrix} -2 & 0 \\ 0 & 0 \end{bmatrix} = \begin{bmatrix} -2-\lambda & 0 \\ 0 & -\lambda \end{bmatrix} = 2\lambda + \lambda^2 = \lambda(2+\lambda)$

$\begin{cases} \lambda = 0, -2 \\ \lambda = 0, -2 \end{cases}$   
not stable