Name
Date
Math 214

**Lab 04**

Predator-Prey System with Beverton-Holt growth in the prey population

$$x\_{t+1}=\frac{r x\_{t}}{1+\frac{r-1}{K}x\_{t}}-αx\_{t}y\_{t} y\_{t+1}=sy\_{t}+βx\_{t}y\_{t}$$

Model Equilibrium Points – Fill in the stability chart based on the simulations you ran as a part of the Checkpoint Exercise. The EQ points should be in terms of the model parameters: $r, s, α, β, K$

|  |  |  |
| --- | --- | --- |
| **Equilibrium Point** | $$(x^{\*},y^{\*})$$ | **Check if stable when** $K=$ **…***Click on the check box to make X appear* |
|  |  | **2.1** | **2.4** | **2.6** |
| Trivial Equilibrium | $$(0,0)$$ |[ ] [ ] [ ]
| Predator Extinction Equilibrium | $$Type equation here.$$ |[ ] [ ] [ ]
| Coexistence Equilibrium | $$Type equation here.$$ |[ ] [ ] [ ]

*Describe/compare the predator extinction equilibrium and the coexistence equilibrium when* $K=2.4$*.*

***Lab Assignment Part 1***

*When* $K=2.6$*, what is the value of the equilibrium point that the model is approaching?*

|  |  |  |  |
| --- | --- | --- | --- |
| $$x^{\*}=$$ |  | $y^{\*}=$  |  |

*When* $K=2.6$*, by considering the distributions of the final population densities shown in the histogram, describe what happens (on average) to the predator and prey populations with respect to the equilibrium point that they would approach in the absence of random environmental conditions? That is, are the final densities of each population, on average, above or below the equilibrium point they are “approaching”?*

*Insert figure A here.*

***Lab Assignment Part 2***

*When* $K=2.1$*, what is the value of the equilibrium point that the model is approaching?*

|  |  |  |  |
| --- | --- | --- | --- |
| $$x^{\*}=$$ |  | $y^{\*}=$  |  |

*When* $K=2.1$*, by considering the distributions of the final population densities shown in the histogram, describe what happens (on average) to the predator and prey populations with respect to the equilibrium point that they would approach in the absence of random environmental conditions? That is, are the final densities of each population, on average, above or below the equilibrium point they are “approaching”?*

*Insert figure B here.*

***Lab Assignment Part 3***

*When* $K=2.4$*, what is the value of the equilibrium point that the model is approaching?*

|  |  |  |  |
| --- | --- | --- | --- |
| $$x^{\*}=$$ |  | $y^{\*}=$  |  |

*When* $K=2.4$*, by considering the distributions of the final population densities shown in the histogram, describe what happens (on average) to the predator and prey populations with respect to the equilibrium point that they would approach in the absence of random environmental conditions? That is, are the final densities of each population, on average, above or below the equilibrium point they are “approaching”?*

*Insert figure C here.*