Dynamic Models in Biology

Homework 2

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**Strogatz 5.2.1**

The steps are

* Find eigenvalues (and classify fixed point from them)
* Find eigenvectors using eigenvector/eigenvalue equation
* Solution is linear combination of eigenvectors and exponentials, use initial conditions to get specific solution

A notebook with math equations and formulas on it

Description automatically generated

Strogatz

**Strogatz 5.2.3**

A notebook with math equations and formulas on it

Description automatically generatedI am not very good at sketching, but the idea for the sketch is that the trajectories should travel more quickly along the fast eigendirection (corresponding to eigenvector for eigenvalue with larger absolute value), and then travel tangent to the slower eigendirection (corresponding to eigenvector for eigenvalue with smaller absolute value).

A notebook with math equations and formulas on it

Description automatically generated**Strogatz 5.2.4**

This is a counter-clockwise spiral, with an unstable fixed point leading to growing oscillations that get exponentially larger (although my sketch doesn’t do a great job of showing that the oscillations get larger as you go farther from the origin)

**Problem 4**

**A notebook with math equations and graphs

Description automatically generated**