

Love

My insatiable desire to model everything

James Arthur

Big MathsJam Weekend, November 2020

The Problem

I'm cripplingly single

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I like to model everything

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I like to model everything

I also really like theoretical thought

The Solution

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That looks good enough!

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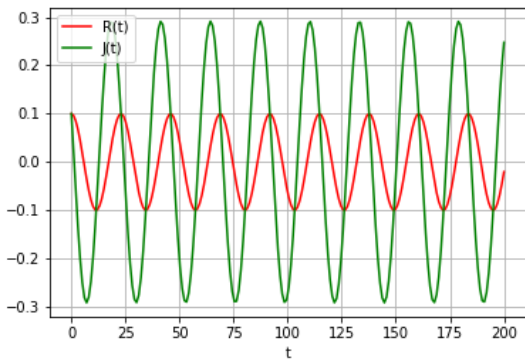


Figure: $a = -0.1$ $b = 0.1$ $c = -0.9$ $d = 0.1$

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So, let's take *our* Romeo (R) and consider his characteristics. He's a mathematician, so he spends a lot of time inside. Maybe he's quite introverted, but he cares a lot about how his Juliet cares about him.

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Now to find a suitable Juliet for our Romeo.

I'm now going to present a new way to look at the system,

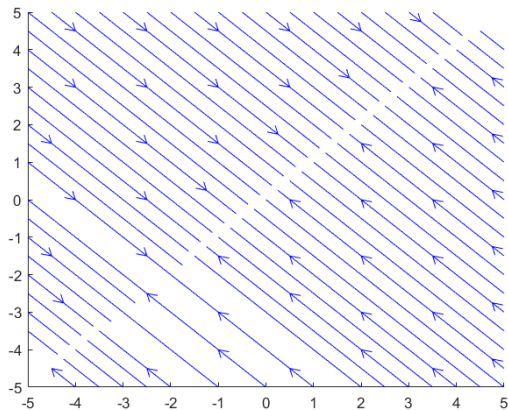


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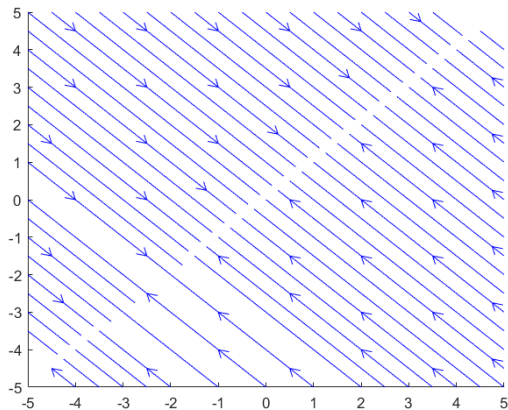


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Juliet is as interesting as this image. There are stable points along that line, meaning that their relationship is stable.

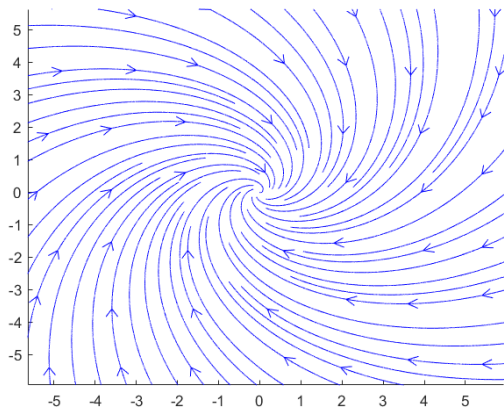


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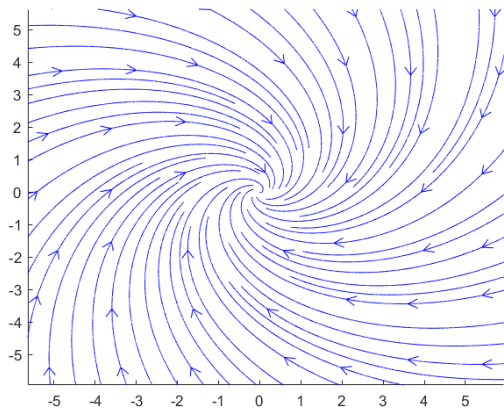


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But this Juliet hates herself and Romeo in equal quantities, maybe these aren't the star-crossed lovers! Let's get non-linear.

The non-linear system

New model, let's replace the J in the first equation with $J(1 - |J|)$ and the R in the second equation with $R(1 - |R|)$.

$$\begin{aligned}\frac{dJ}{dt} &= aR + bJ(1 - |J|) \\ \frac{dR}{dt} &= cR(1 - |R|) + J\end{aligned}$$

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The additional terms add the funny unpredictable what it means to be 'human and in love' stuff to the model.

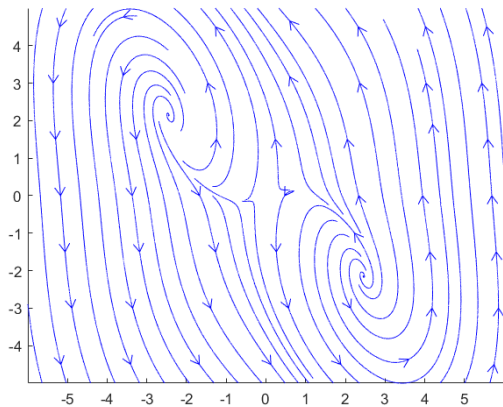


Figure: $a = -1$ $b = 1$ $c = -3$ $d = -5$;

We now have more interesting dynamics. More *realistic* dynamics.

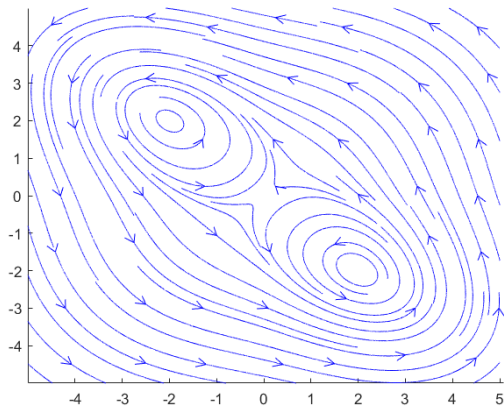
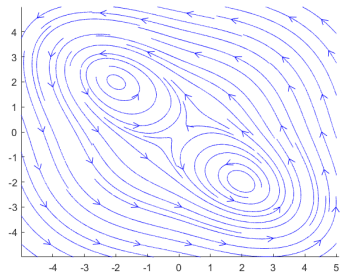


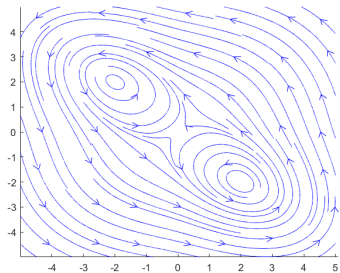
Figure: $a = -1, b = 1, c = -1, d = 1$;

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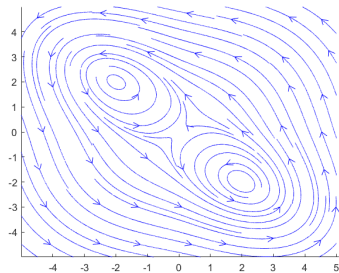
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If you both put some effort in, the maths says it'll work!

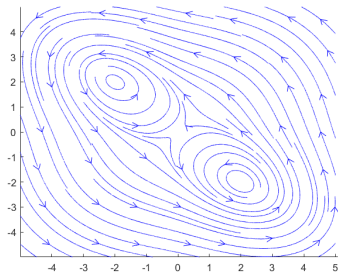


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So she's a c positive and a d negative.

If you both put some effort in, the maths says it'll work!

This has been a bit of fun, and I should note that you shouldn't take any of this to heart. I have missed quite a lot of human nuance by talking quickly in five minutes.



This model can and has been modelled forwards.

I am working on a system with time dependence, and splits of attraction so the model can be used to model differences between platonic and sexual relationships.

Fin

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