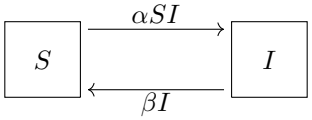
Written HW22 – MATH 3504 Spring 2021

**Due by 23 April for timely completion credit**

In this homework, we will consider the "SIS" disease model. In this model, there are two compartments S ("susceptible") and I ("infected"). In this model, once the infection leaves, the person is susceptible to the disease again (think: common cold).




1. Write the system of two differential equations that models this system.
2. Find the $S$-nullclines and the $I$-nullclines in the phase plane, plot them, and identify the equilibria on your plot.
3. If $\alpha = 0.1$ and $\beta = 0.2$, then identify what happens by picking enough test points and calculating their direction (similar to 14 April notes). Draw a few possible orbits. (*note: the "slope field calculator" can help you see if you did the calculations right – I do want to see at least two test points – one on either side of the vertical equilibrium in quadrant 1!*)
4. How does the behavior of this system differ from the SIR model (from 19 April class)? Write some words about how the orbits and equilibria provide an explanation of why the "common cold never goes away".