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SIR Models with \sqrt{SI} Dynamics

We investigate various forms of SIR models where the disease dynamics is modeled by a \sqrt{SI} term in contrast to the standard SI representation. It is shown, for the general case, that two fixed-points exist, one stable, one unstable. The unstable state consists of only susceptible individuals, while the stable fixed-point has both susceptibles and infective individuals. Using nullclines, we construct geometrically, in the 2-dim S-I phase space, the general behavior of the associated trajectories. To obtain numerical solutions, we show the construction of a nonstandard finite difference (NSFD) scheme for this set of SIR differential equations.

The work reported here is supported by a grant from DOE and funds from the MBRS-SCORE Program at Clark Atlanta University.