Approximate Analytical Solutions to a Continuous Stirred Tank Reactor Problem

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We study a continuous stirred tank reactor (CSTR) problem involving slow catalyst decay. This system is modeled by two nonlinear, coupled ODE's. It is shown that these equations have a single stable fixed-point and that all physical meaningful solutions go to it. This result is also confirmed by examining the behavior of the trajectories for the corresponding 2-dim phase space. After deriving the general qualitative properties of the solutions, we demonstrate that a "reasonable" analytical approximation to the solution can be constructed. Comparison between this result and an accurate numerical solution is made.

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