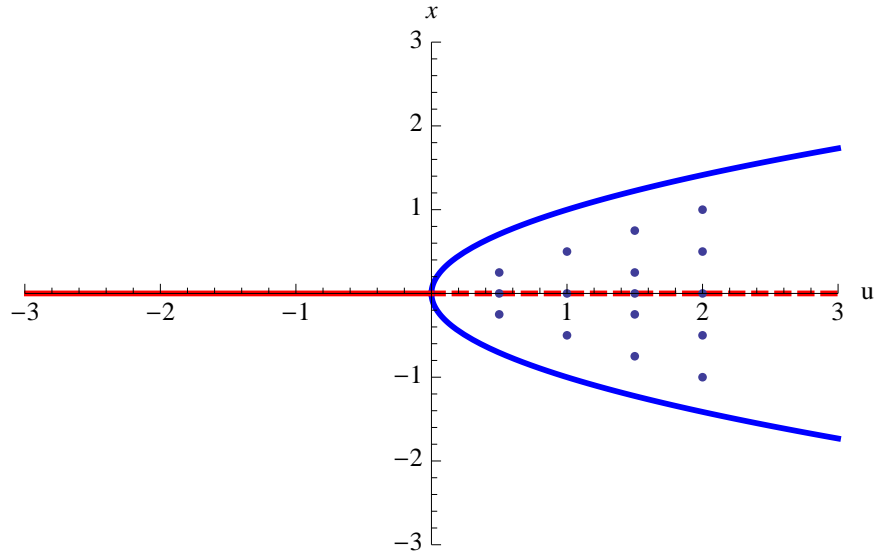
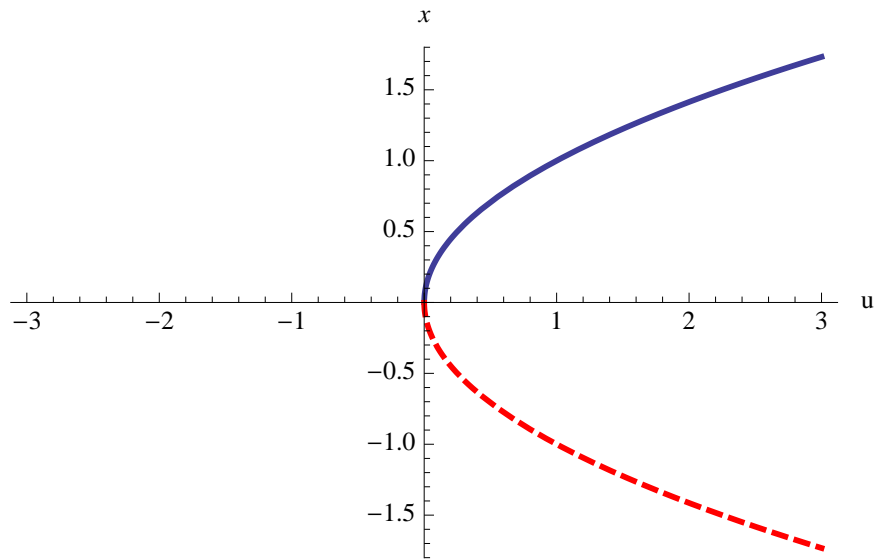


Mathematical Modeling
Quick Guide to Bifurcation Diagrams and Bifurcation Points

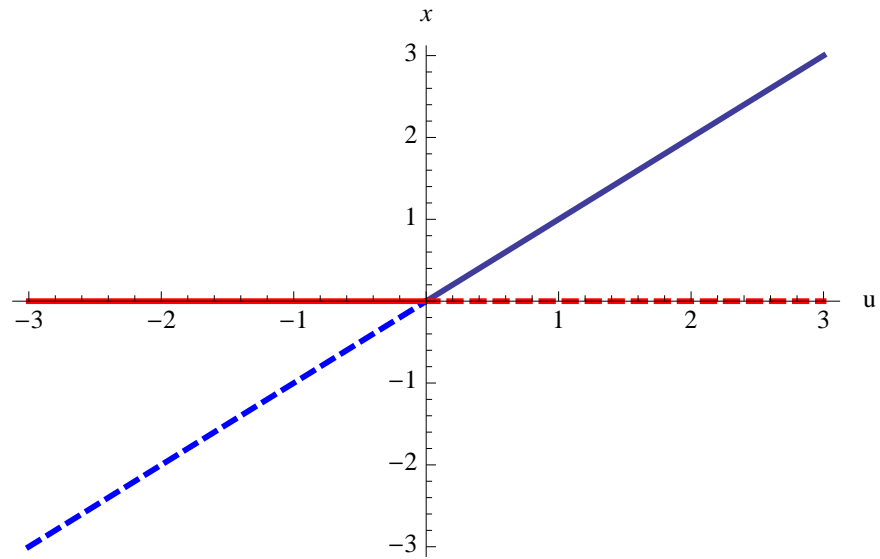
1. *Hopf Bifurcation Point* - A stable state loses stability and a stable periodic solution emerges.
(An unstable state gains stability and an unstable periodic solution emerges.)



2. *Saddle-node Bifurcation Point* - Two new states emerge, one stable and one unstable (saddle).
In the reverse direction, a stable and unstable (saddle) state collide and annihilate each other.



3. *Transcritical Bifurcation Point* - A stable state and an unstable state collide and switch stability.



4. *Pitchfork (or flip) Bifurcation Point* - A stable state loses its stability and two new stable states emerge on either side of the unstable state.

