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Neural Dynamics, Exercise 2, October 23, 2014

Consider this dynamical system:
$$\dot{u} = \alpha - u^2$$
where u is the dynamical variable and α is a parameter.

1. Make a plot of the dynamics ($\dot{u}$ against u) for $\alpha < 0$ and $\alpha > 0$.

2. Compute the fixed points of this dynamics and mark them in the plots.

3. Argue about stability graphically in these plots. Determine the stability of the fixed points formally by establishing that the slope of the dynamics is negative at the fixed point (you can compute the slope as the derivative of the right hand side of the equation by activation).

You can make use of any textbook of dynamical systems for help with this exercise. This is the normal form of the tangent bifurcation... search for that term.