

4. [15 points] Consider the differential equation $y' = y(y^2 + k)$.
- a. [4 points] If $k > 0$, find all equilibrium solutions to this equation. Determine the stability of each and draw a phase diagram.
- b. [4 points] If $k = 0$, find all equilibrium solutions to this equation. Determine the stability of each and draw a phase diagram.
- c. [4 points] If $k < 0$, find all equilibrium solutions to this equation. Determine the stability of each and draw a phase diagram.
- d. [3 points] Use your work from (a)–(c) to draw a bifurcation diagram for this differential equation.