

1 Logistic Growth

1.1 Problems

1. True False A semistable equilibrium occurs in the differential equation $\frac{dP}{dt} = P(K - P) - h$ when the quadratic polynomial $P(K - P) - h$ has a double root.
2. True False It is not possible for there to be no unstable equilibria and two stable equilibria.
3. The percentage of wolves in a population is modeled by the differential equation $\frac{dy}{dt} = y(1 - y)(1 - 3y)$. Sketch some solutions and classify all the equilibria. What will the percentage of wolves be if initially there are an equal amount of wolves and bunny.
4. Draw some solutions and classify the equilibria of $\frac{dy}{dt} = y(2 - y) - 1$.
5. Sketch some solutions and classify the equilibria of $\frac{dy}{dt} = 4 - y^2$.
6. Sketch some solutions and classify the equilibria of $\frac{dy}{dt} = y^2(2 - y)(4 - y)$.
7. Sketch some solutions and classify the equilibria of $\frac{dy}{dt} = y(1 + y)(y - 1)(3 - y)$.