Hw5 Solution

Section 2.5

2 $\frac{dy}{dt} = y(y-1)(y-2)$

Solution:

steady states: $y = 0$, $y = 1$, $y = 2$

signs of $f(y) = y(y-1)(y-2)$.

- $y < 0$, $f(y) < 0$, decreasing
- $0 < y < 1$, $f(y) > 0$, increasing
- $1 < y < 2$, $f(y) < 0$, decreasing
- $y > 2$, $f(y) > 0$, increasing

0 is unstable, 1 stable, 2 unstable.

4 $\frac{dy}{dt} = e^{-y} - 1$

Solution:

steady states: $y = 0$

signs of $f(y) = e^{-y} - 1$.

- $y < 0$, $f(y) > 0$, increasing
- $y > 0$, $f(y) < 0$, decreasing

0 is stable

6 $\frac{dy}{dt} = y^2(y^2 - 1)$

Solution:

steady states: $y = 0$, $y = 1$, $y = -1$

signs of $f(y)$.

- $y < -1$, $f(y) > 0$, increasing
- $-1 < y < 0$, $f(y) < 0$, decreasing
- $0 < y < 1$, $f(y) < 0$, decreasing
- $y > 1$, $f(y) > 0$, increasing

-1 is stable, 0 semi-stable, 1 unstable.

9 $\frac{dy}{dt} = y^2(1-y)^2$

Solution:

steady states: $y = 0$, $y = 1$

signs of $f(y)$.

- $y < 0$, $f(y) > 0$, increasing
- $0 < y < 1$, $f(y) > 0$, increasing
- $y > 1$, $f(y) > 0$, increasing

0 is semi-stable, 1 semi-stable.