

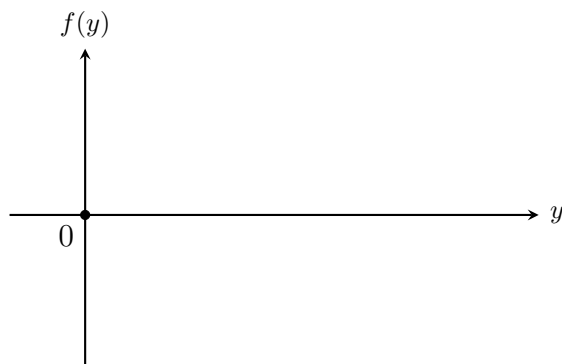
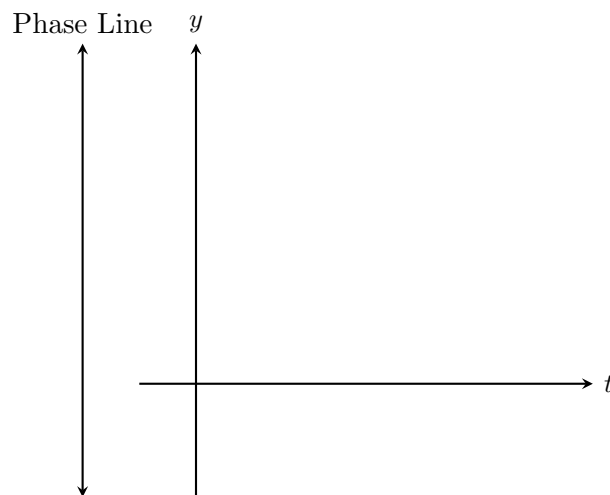
**Worksheet 5: Stability Analysis for 1st Order ODEs**

MATH 2310, Spring 2019

Grade: \_\_\_\_\_ / 40

In each problem sketch the graph of  $f(y)$  vs.  $y$ , determine the equilibrium points, and classify each as asymptotically stable, semi stable, or unstable. Draw the phase line and sketch several graphs of solutions in the  $ty$ -plane.

1. (15 pts)  $\frac{dy}{dt} = y(y-1)(y-2)$ ,  $y_0 \geq 0$ .

Figure 1:  $f(y)$  vs  $y$ Figure 2:  $y$  vs.  $t$

2. (15 pts)  $\frac{dy}{dt} = y^2(1-y)^2, \quad -\infty < y_0 < \infty.$

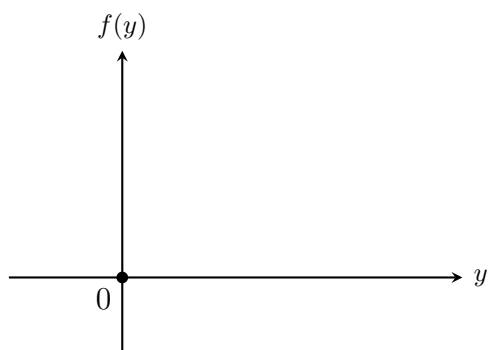


Figure 3:  $f(y)$  vs  $y$

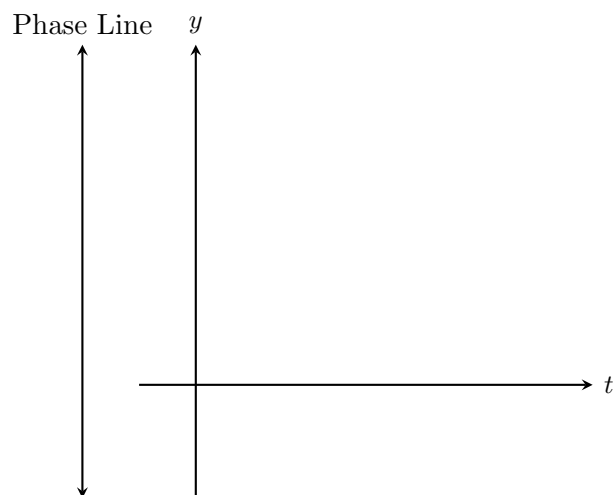


Figure 4:  $y$  vs.  $t$

3. (10 pts)  $\frac{dy}{dt} = -k(y-1)^2$ ,  $k > 0$ ,  $-\infty < y_0 < \infty$ .



Figure 5:  $f(y)$  vs  $y$

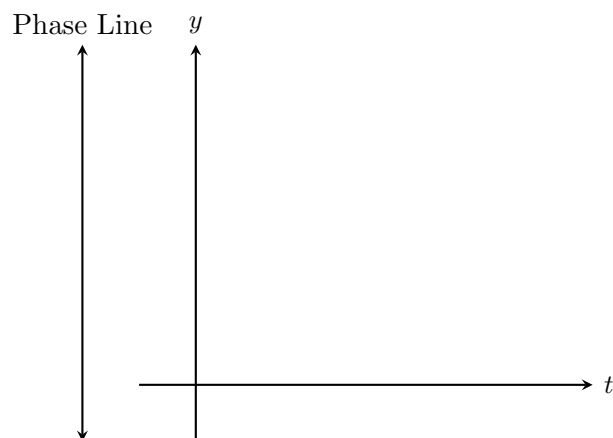


Figure 6:  $y$  vs.  $t$