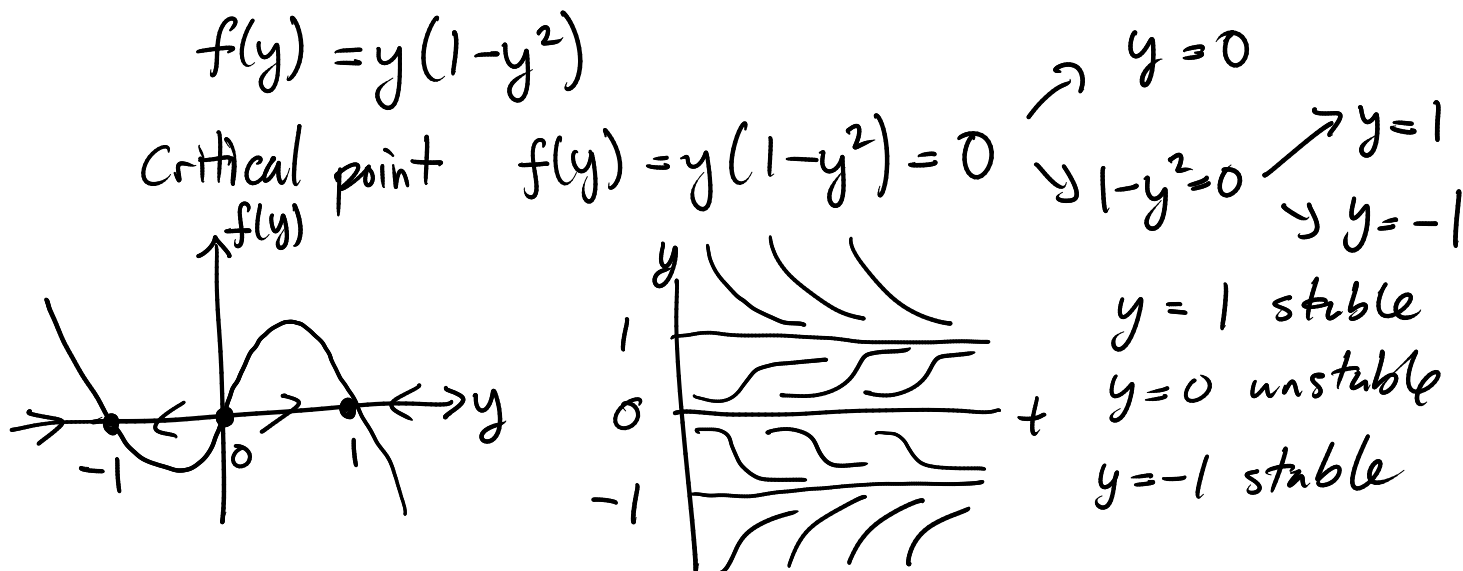


- Show all work.
- No books, notes, calculators, or other electronic devices.

1. (8 points) Consider the autonomous ordinary differential equation

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

Find the critical points, and determine whether each is stable, unstable, or semistable. *Hint:* it may be helpful to draw a plot of $y(1 - y^2)$ versus y .



2. (1 point) How does the solution starting at $y(0) = 0.5$ behave as $t \rightarrow \infty$?

Start at $y(0) = 0.5$ then increase to the stable critical point at 1 : $y \rightarrow 1$

3. (1 point) How does the solution starting at $y(0) = 0$ behave as $t \rightarrow \infty$?

0 is a critical point so $y(t) = 0$ is a constant solution $y \rightarrow 0$