Quiz 6

Name: _____

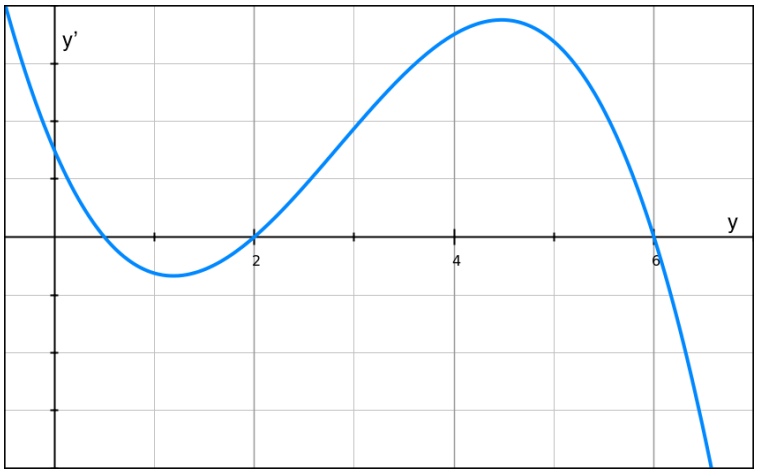
You will have 20 minutes ∘ Calculators are allowed ∘ Show all work for credit ∘ Don't cheat ∘ attempts at a problem may count for partial credit. ∘ If you get stuck, show as much work as possible.

1. Consider the differential equation $\frac{dy}{dt} = 0.5(2y-1)^3$.

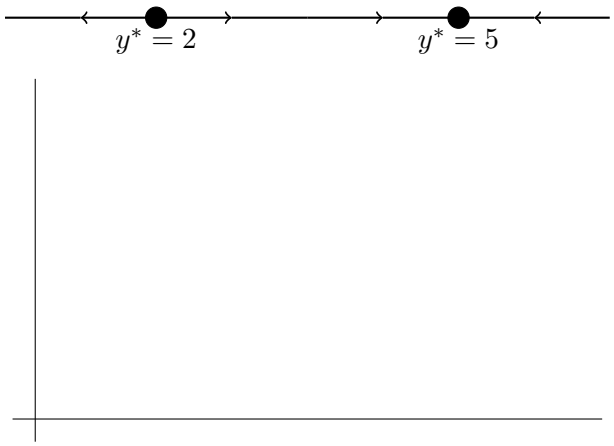
   (a) [3 pts] Find the equilibria of this equation.

   (b) [2 pts] Is this equilibrium stable, unstable, or neither?

2. [3 pts] From the graph shown below, sketch the phase-line diagram for y. [Note that the axes below are y' and y.]



3. [3 pts] From the phase-line shown below, sketch a solution beginning at $y(0) = 3$. **Label your axes.**



4. [2 pts] Suppose that $\frac{dy}{dt} = f(y)$, and that $y^* = 0$ is an equilibrium. I tell you that $f'(0) = -3$. Is $y^* = 0$ a stable or unstable equilibrium? Why?

5. [2 pts] Check that $H(t) = 30 - 10e^{-2t}$ is a solution to Newton's law of cooling $\dfrac{dH}{dt} = 2(30 - H)$. [Don't use separation of variables.]