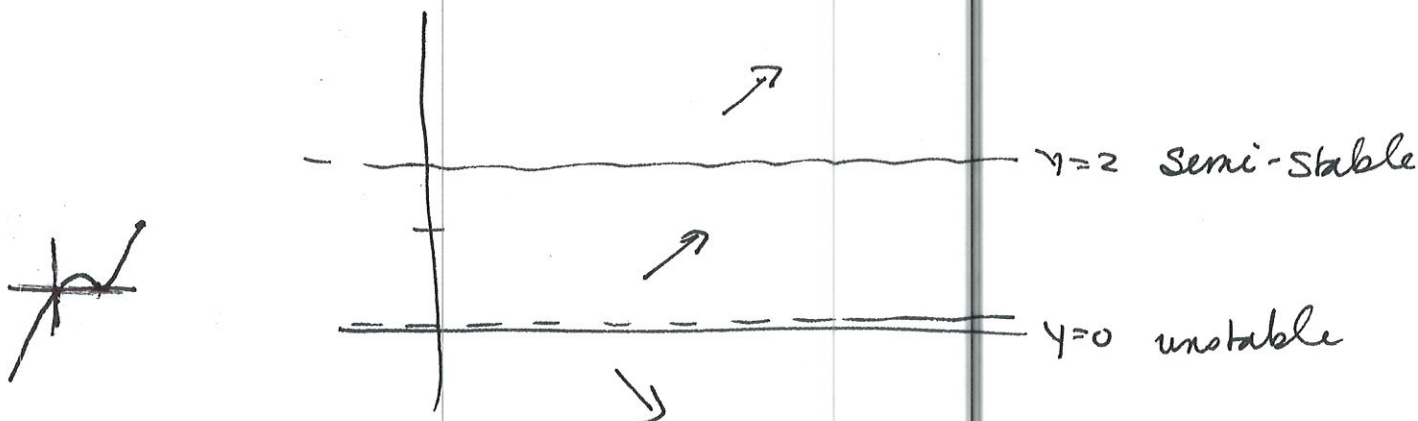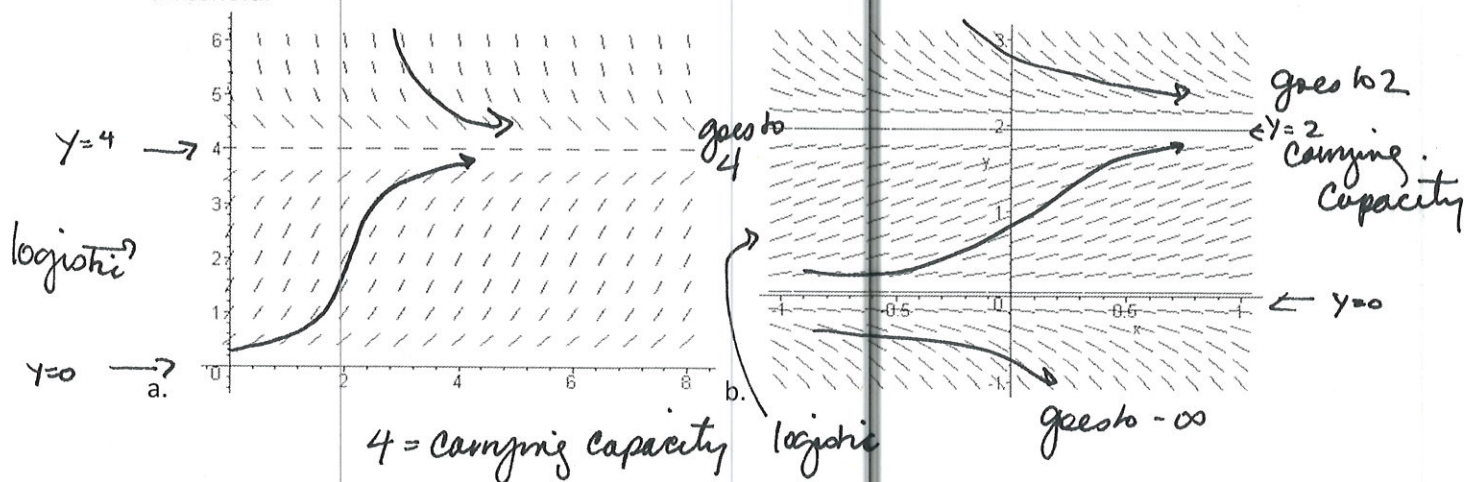Name _____ KEY _____

Instructions: Show all work. Use exact answers unless otherwise asked to round.

1. Graph the direction field for $y' = y(y-2)^2$ by hand and comment on the stability of each equilibrium.

$y = 2$ Semi-Stable

$y = 0$ unstable

2. Direction fields for population models are shown below. Find a differential equation that models the population (up to a constant multiple). Plot trajectories of initial conditions that models each type of trajectory for the model. Where is the model logistic? Describe the long-term behavior of each trajectory. Describe each equilibrium as a carrying capacity or a threshold.

$y = 4$ →

logistic?

$y = 0$ →?

goes to 4

a.

4 = carrying capacity   logistic

b.

goes to 2

$y = 2$ carrying capacity

← $y = 0$

goes to $-\infty$

$$\frac{dy}{dt} = -(y-4) \cdot y$$

$$\frac{dy}{dt} = y(4-y)$$

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