

Name: \_\_\_\_\_

**Directions:** Show all work. No credit for answers without work.1. Consider the differential equation  $\frac{dy}{dt} = y^2 - 5y + 6$ .(a) [**2 points**] Draw a direction field for  $y(t)$ .(b) [**1 point**] Determine the limiting behavior of  $y$  as  $t \rightarrow \infty$ .2. [**3 points**] Find the general solution to  $y' = 4 - 3y$ .

3. Let  $y(t)$  be the number of rabbits on an island at time  $t$  (months). The rabbits produce new offspring at a rate proportional to the population, with proportionality constant  $2 \text{ (months)}^{-1}$ . Owls hunt the rabbits, consuming a total of 100 rabbits per month.

(a) [1 point] Give a differential equation for  $y(t)$ .

(b) [2 points] Given that the island starts with 45 rabbits, find a formula for  $y(t)$ .

(c) [1 point] Will the rabbits survive? If not, then how long will the rabbits last?