

Math 31L Lab Quiz #2

Chemical Rates Lab

Blake, Fall 2001

Name: _____

1. (15 points) (a) Solve the following differential equations for $y(t)$ and $w(t)$. You must show all of your work clearly. Unsupported answers will receive no credit.

$$\frac{dy}{dt} = 3w, \quad y(0) = 5; \quad \frac{dw}{dt} = -3w, \quad w(0) = 10.$$

- (b) What is the equilibrium value of y ? You must show work to support your answer.

(over)

2. (15 points) Consider the differential equations below, with the indicated initial conditions.

$$\frac{dy}{dt} = -5y + 7w ; \quad \frac{dw}{dt} = 5y - 7w ; \quad y(0) = 20 \text{ and } w(0) = 16.$$

(a) Explain clearly why $y(t) + w(t)$ must be constant. What is the constant?

(b) To find $y(t)$ in terms of t , the first step would be to find a differential equation involving $\frac{dy}{dt}$ which we can solve easily with “z-substitution.” Do that now; i.e., produce an expression for $\frac{dy}{dt}$ which we can solve easily. Be sure to show all of your work. **Do not solve the differential equation that you give as the answer to this problem.**

(c) The function, $y(t)$, that is part of the solution to the system above is $y(t) = 21 - e^{-12t}$. Find $w(t)$ in terms of t .

(d) Compute the equilibrium value of y two different ways.

Without using the solution given in part (c) above:

Another way: