

# Math 31L Lab Quiz #4

Blake, Fall 1999

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

1. (15 points) Suppose we use the differential equation  $\frac{dW}{dt} = 0.05W - 6000$  to model the growth of a company, where  $W(t)$  represents the company's net worth at year  $t$ .

(a) What does the factor 0.05 represent? [Pick one answer.]

- \_\_\_\_\_ The prime interest rate.
- \_\_\_\_\_ The interest charged by the bank on loans made to the company.
- \_\_\_\_\_ The instantaneous rate of change of the company's net worth.
- \_\_\_\_\_ The average growth rate of the economy during the time in which we use the model.

(b) What does the factor 6000 represent? [Pick one answer.]

- \_\_\_\_\_ The company's fixed annual expenses.
- \_\_\_\_\_ The equilibrium value of  $W$ .
- \_\_\_\_\_ The initial investment.
- \_\_\_\_\_ None of these.

(c) How large must the initial value of  $W$  be to ensure that the company will grow over time? You must justify your answer.

(d) Circle every expression for  $W(t)$  below which is a solution to this differential equation.

$$W(t) = 120,000 + e^{-0.05t}$$

$$W(t) = 120,000 + e^{-0.05t}$$

$$W(t) = 120,000 - 10,000e^{0.05t}$$

$$W(t) = 120,000 + 10,000e^{0.05t}$$

$$W(t) = 6,000 + e^{0.05t}$$

$$W(t) = 6,000 + e^{-0.05t}$$

$$W(t) = 120,000$$

$$W(t) = e^{0.05t}$$

2. (5 points) Suppose now that  $\frac{dW}{dt} = \mu W - 6000$ ,  $\mu(t) = 0.05 + .03 \sin\left(\frac{\pi}{2}t + \frac{\pi}{4}\right)$ , and  $W(0) = 140,000$ . Use Euler's method with  $\Delta t = 0.3$  to estimate  $W(0.3)$ . For credit you must show your computations and any formulas that you use.