

NAME: _____

MATH 1470 Fall 2003 Tintera

TEST 2: Human Population and Logistic Models. Covers Chapters 4 - 6

5. Rabbit print overalls, sold by S-Mart, are all the rage at day care centers across the country. When they were first introduced, the number sold was increasing at a rate of 2% per day. Marketing experts estimate that they will be able to sell 200 thousand of the overalls.

a) Write a logistic model for the number of overalls sold. Be explicit about the variables.

b) Sketch a graph of the number sold over time. Be sure to label the axes for your graph.

c) How many overalls would be sold in a day if 80 thousand had been sold up to that day?

d) For the following numbers of overalls sold, when is the number sold per day the greatest: After 10 thousand were sold, after 100 thousand were sold, or after 150 thousand were sold?

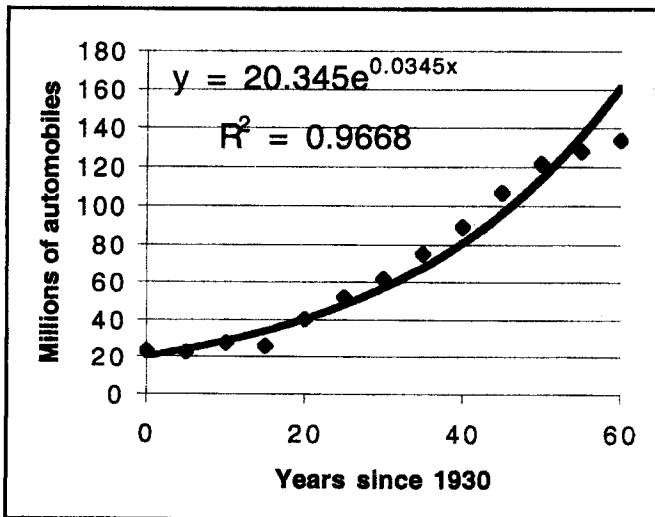
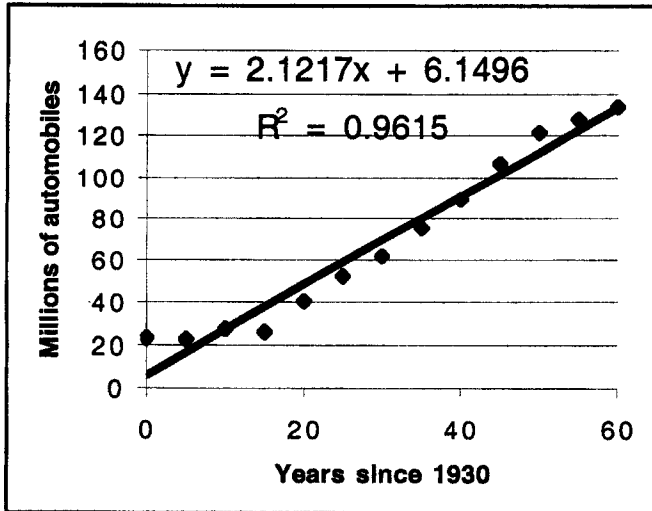
2. Below is the population and banana production of Costa Rica

Year	Population	Bananas	Increase in population	% increase in population
1991	3144	1720		
1992	3245	1920	101	3.16%
1993	3349	1500	104	3.15%
1994	3452	2000	103	3.03%
1995	3554	2300	102	2.91%
1996	3652	2400	98	2.72%
1997	3748	2300	96	2.59%
1998	3841	2500	93	2.45%

a) Does the growth of the population of Costa Rica match the description of what Thomas Malthus said about the growth of human populations.

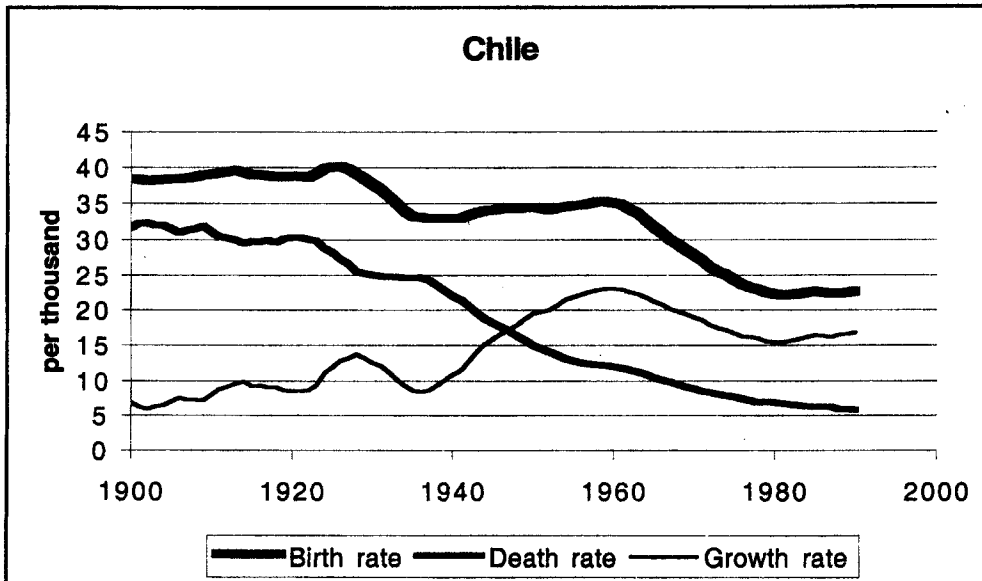
b) Find the per capita banana production of Costa Rica. Does it match the post WWII definition of Malthusianism? (Be sure to say what post WWII definition of Malthusianism is.)

1. (20 points) Below are graphs of the number of automobiles in America from 1930 to 1990, along with a model: linear on top, exponential below. In addition to the information shown on the graphs, you might want to know that the RMSR for the linear model was 7.94, while the RMSR for the exponential model was 9.70. Discuss pros and cons of each model in a couple of sentences, reaching a conclusion about which model you'd prefer.



(10 pts)

2. Below is a graph of birth, death, and growth rates in Chile for this century. Discuss whether or not Chile is undergoing/has undergone a demographic transition. For full credit, your answer should convince me you know what a demographic transition is, as well as show me that you know how to use the information in the graph to determine whether or not there is/was one in Chile.



(15 pts)

4. Consider the following table, which gives the population of the U.S. and the number of cars in the U.S., both expressed in millions.

Year	Population	# of cars	(a) What is the five-year moving average for the population in 1994?
1990	249.5	133.7	(b) What is the number of cars per capita for the U.S. in 1997?
1991	252.2	128.3	
1992	255.0	126.6	(c) What is the population in 1995, indexed with the base year 1990?
1993	257.8	127.3	
1994	260.3	127.9	
1995	262.8	128.4	
1996	265.2	129.7	
1997	267.8	129.7	

(15 pts) 5. The number of cable TV systems in the United States seems to be governed by a logistic model,

$$\frac{\Delta x}{\Delta t} = 0.25x - 0.00002273x^2$$

(a) Find the maximum number of cable TV systems predicted by the model.

(b) If there were 9,575 cable TV systems in 1990, how many cable TV systems are predicted by the model for 1991?