

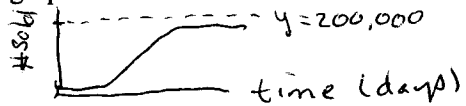
NAME: Solution
 MATH 1470 Fall 2003 Tintera
 TEST 2: Human Population and Logistic Models. Covers Chapters 4 - 6

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.

$$\frac{\Delta y}{\Delta t} = 0.02 y \left(1 - \frac{y}{200,000} \right), \quad y = \# \text{ sold so far } t = \text{time (days)}$$

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?

$$960 = 0.02 (80,000) \left(1 - \frac{80,000}{200,000} \right) \quad \left(\text{Had let } y = 80,000 \right)$$

$\# \text{ sold that day} = \text{change in total } \# \text{ sold.}$

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?

y	10k	100k	150k
Δy	190	1000	730

Δy greatest at 100k by observation

or Δy greatest at $L/2 = 200k/2 = 100k$.

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

Year	Population	Bananas	Increase in population	% increase in population	$\frac{\Delta y}{y}$
1991	3144	1720			
1992	3245	1920	101	3.16%	.031
1993	3349	1500	104	3.15%	.031
1994	3452	2000	103	3.03%	.030
1995	3554	2300	102	2.91%	.029
1996	3652	2400	98	2.72%	.028
1997	3748	2300	96	2.59%	
1998	3841	2500	93	2.45%	

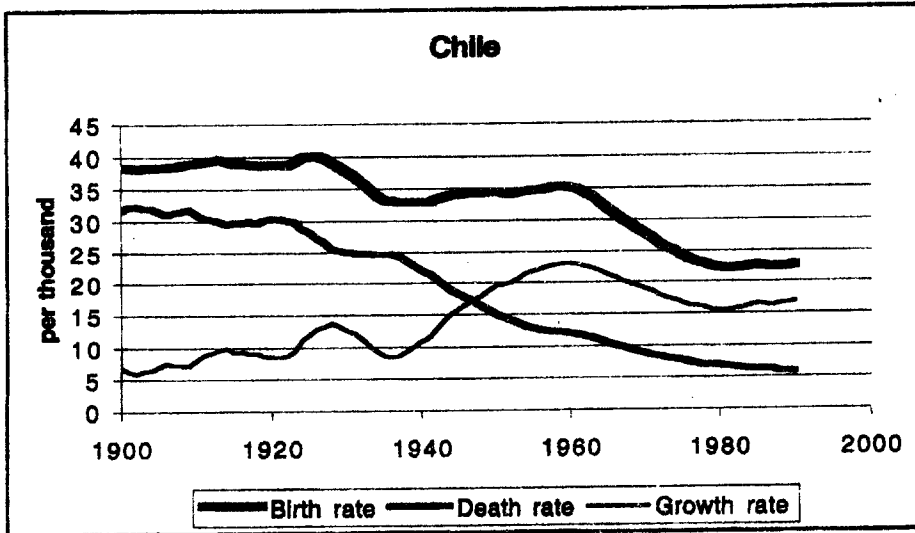
a) Does the growth of the population of Costa Rica match the description of what Thomas Malthus said about the growth of human populations. No $\frac{\Delta y}{y}$ is tending to decrease rather than stay constant. M. expected exponential growth, i.e. constant $\frac{\Delta y}{y}$

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.)

Banana Prod per capita = Bananas / Population
 varied but tended to increase. This is the opposite of Modern Malthusianism where Food/capita decreases.

(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.



low growth rate to 1940
b/c of balanced birth/death.

Growth rate rises after '40

Growth rate yet to fall

In Stage II.