NAME: _____
MATH 1470 Fall 2004 Tintera
TEST 2: Malthus, Demographic Transition and Logistic Models. Covers Chapters 5-6

You may use calculators and one 8.5 by 11 inch page of handwritten notes. Please show all work on this test booklet. Partial credit is awarded only for work shown. Each problem is worth as indicated. Good luck!

For the first three questions, choose the best answer by circling the letter for that answer.

1. Which of the following correctly relate Malthus' terminology to modern terminology:

   A. Arithmetic growth is the same as logistic growth.
   B. Geometric growth is the same as exponential growth.
   C. Arithmetic growth is the same a exponential growth.
   D. Geometric growth is the same as linear growth.

2. Which of the following is NOT true about indexing of a population

   A. Indexing a population helps make it easier to compare between data sets.
   B. Indexing a population helps make it easier to see growth rates.
   C. Indexing a linear model makes the data into exponential.
   D. If a year's population is less than the population during the base year, the index will be less than 100.

3. Which of the following is true about demographic transitions:

   A. Death rates fall in a country before the birth rates.
   B. The growth rates fall and then rise.
   C. The birth rate rises as a result of prosperity.
   D. The death rate rises as a result of industrialization.

4. Below are the current birth and death rates for two countries. For each of them find the growth rate expressed as a percentage and your best guess as to the stage of the demographic transition of the given country. Your answer should indicate that you understand what a demographic transition is.

Country 1: Central African Republic

Current Birth Rate: 36.6 births per thousand Current Death Rate: 18.6 deaths per thousand.

a) Current Growth Rate

b) Stage:

Country 2: Finland

Current Birth Rate: 10.6 births per thousand Current Death Rate: 9.8 deaths per thousand.

c) Current Growth Rate

d) Stage:

5. The following data is about the population and food production in Ethiopia:

Year	Population	Food	Food per Capita
1962	39655	47.9	0.001208
1966	44244	50.6	0.001144
1970	49591	64.5	0.001301
1974	55444	64.2	0.001158
1978	61951	54.9	0.000886
1982	69482	60.1	0.000865
1986	77987	74.6	0.000957
1990	87031	97.4	0.001119

a) Does the production of food in Ethiopia match what Malthus said about food production in general? Be clear about what he said, what you see and your conclusion.

b) Does the country of Ethiopia appear to be suffering from the Post WWII definition of Malthusianism. Be clear about what it is, what you see and your conclusion.

6. The number, x, of fishing licenses in Corpus Christi seems to be governed by a the logistic model:

$$\frac{\Delta x}{\Delta t} = 0.0625x - 0.0000045x^2$$

a) Find the maximum number of fishing licenses in Corpus Christi predicted by the model.

b) If there were 10,000 fishing licenses in Corpus Christ one year, how many would there be the next year?

c) When would there be the greatest increase in fishing licenses in Corpus Christi?

7. Sales of sodas at the ALCS baseball game increased about 2% per minute and sales per minute peaked after 1200 gallons had been sold.

a) What type of model is appropriate for this situation? Explain.

b) Write the equation for the model you chose. Be sure to explicitly define the variables used.

8. Below is a spreadsheet of the population and food supply for Libya for the years given.

	A	B	C	D	E	F
1	Year	Libya Pop.	Food	5 Yr Centered Mvg Avg—Food	Per Capita Food	Indexed Pop (Base = 1966)
2	1962	1452	22.7			
3	1966	1688	35.6		**?**	
4	1970	1986	35.8			
5	1974	2344	55.2	**?**		
6	1978	2783	70.4			
7	1982	3336	87.6			**?**
8	1986	3924	91.3			

a) For each of the cells below, show the formulas as they would be entered into an Excel spreadsheet. Where appropriate, put $ signs to indicate values that don't change.

D5:

E3:

F7:

b) Into which cells in the table above could the formula in cell D5 be copied? Assume that row 8 is the last in the table.