WR3: Writing Assignment 3 Name _____
World Population and Concavity Due Friday, September 22, 2006

1. The bar to the right represents 200 million people (about two thirds the size of the population of the United States.) Suppose it measures 10 inches tall.

(1) a. How tall is a bar that represents 1 billion (10^9) people, if on the same scale?
Hint: Since $10^9 = 10^{\square}10^6$, then $10^9 =$_____ million.

The bar would be _____ inches = _____ feet tall.

(1) b. How tall is a bar that represents 10 billion people, if on the same scale?
Hint: 10 billion = $10 \cdot 10^9 = 10^{\square} = 10^{\square}10^6 =$_____ million.
The bar would be _____ inches = _____ feet tall.

2. The graph on the following page is from the United Nations Population Division published in 1999, which is the year the world population first hit 6 billion. The width of each bar represents a time span of 10 years. For example, the first light gray bar is the interval from 1750 to 1760. All darkly shaded bars are **predicted** increments, not actual. Note that population increments and population size are measured using different scales (millions and billions, respectively). From Question 1, note that these are quite different in size if they were both on the same scale.

(1) a. Look up the word "increment" and "decrement" in a good dictionary (such as the *American Heritage Dictionary of the English Language*). What are the <u>mathematical</u> meanings of these words? (Which capital Greek letter is used to denote increments and decrements? ___)

(1) b. There are six darkly shaded bars.
What time interval is represented by the sixth gray bar? From _____ to _____.

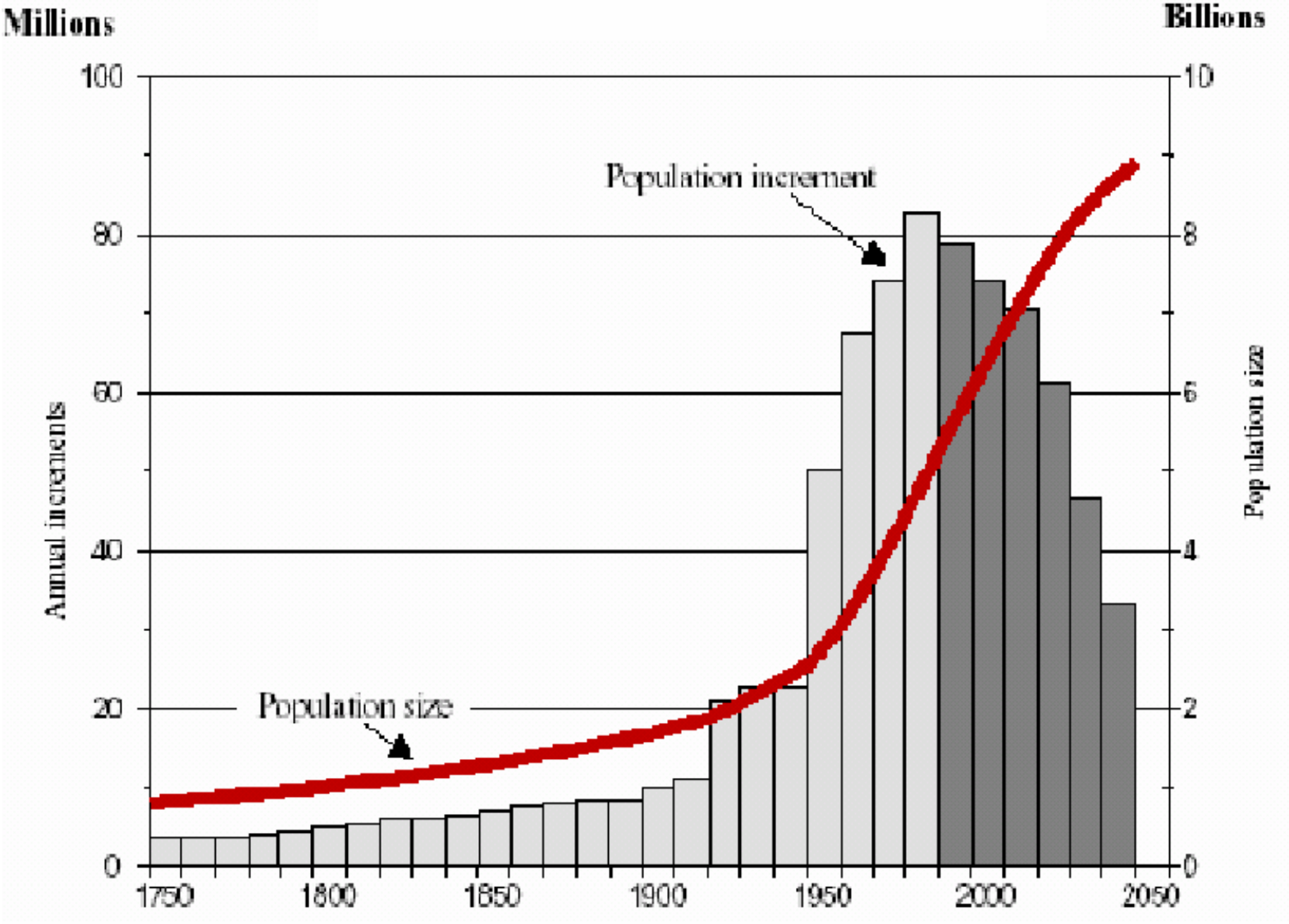
(1) 3. Why does the graph of population size continue to increase even though the darkly shaded bars decrease?

(1) 4. Mark on the graph of the population size (with an **X**) when it changes its concavity.

(2) 5. In which years is the graph concave up? From _____ to _____.

When is the above graph concave down? From _____ to _____.

(2) 6. On a separate sheet of paper, (**typed!),** please write a paragraph which answers the following. How are the *heights of the bars* of the population increment related to the *concavity of the graph of the population size*? (Check that this is consistent with your answer to Questions 4 and 5.) Why does the graph of population size continue to increase even though the darkly shaded bars decrease? Use this model to find what the UN predicts will be the population in 2050. The UN is making an assumption by the predicting the darkly shaded bars as shown on the next page. What is this assumption, and, do you believe it is a correct assumption?


Millions
Billions
100
80
60
40
20
0
10
8
6
4
2
0
Annual increments
Population size
Population increment
Population size
1750
1800
1850
1900
1950
2000
2050