

Problems	1	2	3	4	5	Total		Grade
Points							%	
Out of	36	21	27	10	6	100		

Relax. You have done problems like these before. Even if these problems look a bit different, just do what you can. If you're not sure of something, please ask! You may use your calculator. Please show all of your work and write down as many steps as you can. Don't spend too much time on any one problem. Please leave the following grading key blank for me to use. Do well. And remember, ask me if you're not sure about something.

A few formulas from our book:

Percentage Change Formula

To get the result of increasing an amount by $r\%$, multiply by $1 + \frac{r}{100}$.

To get the result of decreasing an amount by $r\%$, multiply by $1 - \frac{r}{100}$.

The Growth Factor Formula

If an amount is growing exponentially and the amount changes from P to A in T time periods, then the growth factor g is given by the formula

$$g = \left(\frac{A}{P}\right)^{\left(\frac{1}{T}\right)}$$

Log Divides Formula

The equation $b^T = v$ has solution

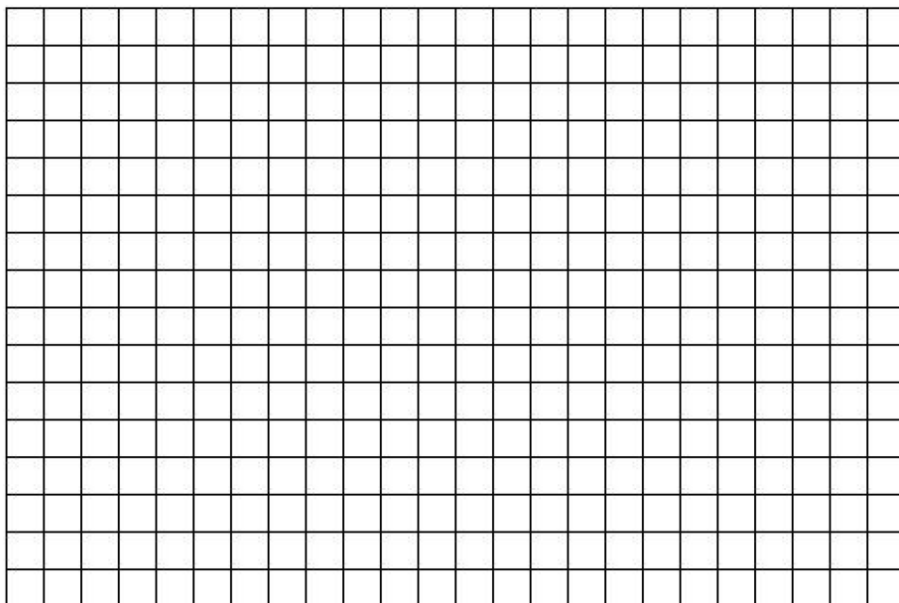
$$T = \frac{\log(v)}{\log(b)}$$

1. Biologists in Florida have found a direct link between population increases and decline in local black bear populations. In 1953 the black bear population was 11,000. From that time it had been decreasing at a rate of 6% per year. From the initial estimate of 11,000 the black bear population has decreased to B bears in Y years since 1953 where

$$B = 11000(0.94)^Y$$

- (a) Make a table of values showing the bear population 10, 20, 30, 40, and 50 years after 1953.

- (b) Draw a graph illustrating the dependence. *Be sure to include all the information given and space your axes evenly.*



The problem continues

- (c) When will the bear population drop below 750 bears? Approximate the answer from your graph and then refine your answer by successive approximation to the nearest year.

- (d) Now show how to exactly solve the equation to determine when the bear population will be below 750 bears.

2. Tuition, room, and board at a private four year college cost \$21,644 in 1989. The same college today in 2009 now costs \$34,132. Let C denote the cost of the college (in \$) and Y the year, measured in years since 1989. Suppose that these fees have been increasing at a constant rate each year.

(a) By how many dollars per year have college costs increased?

(b) Write an equation illustrating this model.

(c) According to this equation, how much will the college cost by the year 2029?

(d) What type of equation is being used here?

3. Remember from the previous problem that tuition, room, and board at a private four year college cost \$21,644 in 1989. The same college today in 2009 now costs \$34,132. Let C denote the cost of the college (in \$) and Y the year, measured in years since 1989. This time assume instead that the fees have been increasing a fixed percentage each year.

(a) What is the annual growth factor that fees increased?

(b) Write an equation illustrating this model.

(c) According to this new equation, how much will the college cost by the year 2029?

(d) What type of equation is being used here?

4. Seth would like to determine how many cells his body contains. From a biology book he discovered that a single cell has a mass of 0.000000000001 kilograms.

(a) Write the mass of a cell in scientific notation.

(b) Express the mass of the cell as a conversion factor. In other words, complete the following:

1 cell = _____ kilograms

(c) Seth weighs 180 pounds. How many cells are in Seth's body? *Use the fact that 1 kilogram \approx 2.2 pounds.*

5. In 1985 the population of Nicaragua was 3,710,000. Today in 2009 the Nicaraguan population is 5,891,199. Assuming this increase is exponential, what is the annual percent increase for Nicaragua's population?