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## GP Unit 4

**Name:**

**Section Number:**

### Instructions:

- Identify the document by typing your full name and section number next to the yellow text.
- Rename the file by adding your last names to current file name (e.g., "u4gp\_lastnames.doc").
- Type your answers next to the yellow text.
- To show your work, you will need to include
  - the formula with substituted values.
  - the final calculated answer with units.

### Please add your file.

- 1) An open-top box is to be constructed from a 6 by 8 foot rectangular cardboard by cutting out equal squares at each corner and the folding up the flaps. Let  $x$  denote the length of each side of the square to be cut out.
- a) Find the function  $V$  that represents the volume of the box in terms of  $x$ .

**Answer**

- b) Graph this function.

**Show Graph here**

- c) Using the graph, what is the value of  $x$  that will produce the maximum volume?

**Answer**

- 2) The volume of a cylinder (think about the volume of a can) is given by  $V = \pi r^2 h$  where  $r$  is the radius of the cylinder and  $h$  is the height of the cylinder. Suppose the volume of the can is 100 cubic centimeters.

- a) Write  $h$  as a function of  $r$ .

**Answer**

**Show work in this space**

- b) What is the measurement of the height if the radius of the cylinder is 2 centimeters?

Answer

Show work in this space

- c) Graph this function.

Show graph here

- 3) The formula for calculating the amount of money returned for an initial deposit money into a bank account or CD (Certificate of Deposit) is given by

$$A = P \left( 1 + \frac{r}{n} \right)^{nt}$$

$A$  is the amount of returned.

$P$  is the principal amount initially deposited.

$r$  is the annual interest rate (expressed as a decimal).

$n$  is the compound period.

$t$  is the number of years.

Suppose you deposit \$10,000 for 2 years at a rate of 10%.

- a) Calculate the return ( $A$ ) if the bank compounds annually ( $n = 1$ ).

Answer:

Show work in this space. Use ^ to indicate the power.

- b) Calculate the return ( $A$ ) if the bank compounds quarterly ( $n = 4$ ).

Answer:

Show work in this space

- c) Calculate the return ( $A$ ) if the bank compounds monthly ( $n = 12$ ).

Answer:

Show work in this space

- d) Calculate the return ( $A$ ) if the bank compounds daily ( $n = 365$ ).

Answer:

Show work in this space

- e) What observation can you make about the increase in your return as your compounding increases more frequently?

Answer:

- f) If a bank compounds continuous, then the formula takes a simpler, that is

$$A = Pe^{rt}$$

where  $e$  is a constant and equals approximately 2.7183.

Calculate  $A$  with continuous compounding.

Answer:

Show work in this space

- g) Now suppose, instead of knowing  $t$ , we know that the bank returned to us \$15,000 with the bank compounding continuously. Using logarithms, find how long we left the money in the bank (find  $t$ ).

Answer:

Show work in this space

- h) A commonly asked question is, "How long will it take to double my money?" At 10% interest rate and continuous compounding, what is the answer?

Answer:

Show work in this space

- 4) For a fixed rate, a fixed principal amount, and a fixed compounding cycle, the return is an exponential function of time. Using the formula,  $A = P\left(1 + \frac{r}{n}\right)^{nt}$ , let  $r = 10\%$ ,  $P = 1$ , and  $n = 1$  and give the coordinates  $(t, A)$  for the points where  $t = 0, 1, 2, 3, 4$ .

- a) Show coordinates in this space

Show work in this space

- b) Show graph here

- 5) Logarithms:

- a) Using a calculator, find  $\log 10000$  where  $\log$  means  $\log$  to the base of 10.

Answer:

- b) Most calculators have 2 different logs on them:  $\log$ , which is based 10, and  $\ln$ , which is based  $e$ . In computer science, digital computers are based on the binary numbering system which means that there are only 2 numbers available to the computer, 0 and 1. When a computer scientist needs a logarithm, he/she needs a  $\log$  to base 2 which is not on any calculator. To find the  $\log$  of a number to any base, we can use a conversion formula as shown here:

$$\log_b a = \frac{\log a}{\log b}$$

Using this formula, find  $\log_2 10000$ .

Answer:

Show work in this space