

This assignment is due on **November 13, 2012**.

Goals:

- 1) To practice the art of communicating a written solution to a math problem. You must clearly present the key concepts and the logical sequence of steps taken to arrive at a solution. Just answers are not good enough! Illustrations of solutions by graphing or drawing diagrams are often part of your presentation.
- 2) To encourage the use of the math textbook as a resource for you to learn from and get explanations of concepts and sample solutions.
- 3) To encourage a dialog between students of concepts and processes to achieve solutions to mathematical problems.

Format requirements:

This assignment will be graded so you must show at least one (most of these questions require many more than one) step of work for each question. If I cannot see clearly what you have done I cannot give you the marks. There is only one accepted format for this and all future assignments.

- 1) You will choose **3 of the 5** given questions to complete. (It is still to your advantage, however, to know how all of them are done.) All questions are worth the same number of marks. The questions must be in the same order that they are presented to you. If you do more than 3 questions, only the first 3 will be marked.
- 2) Each step  
for each question  
must be  
on the next line  
down, not to the right.
- 3) Students are encouraged to help each other with understanding the assignments but must submit their own work.
- 4) Any explanations must be done in complete sentences with proper mathematical notation as necessary.

Marks will be deducted if these requirements are not met. Students will be penalized 20% per day when assignments are turned in late and be worth 0 (zero) on the day they are handed back to the students.

Copied assignments will not be marked.

### Questions:

1. An exponential function  $f(x) = ab^x$  passes through the points  $(1, 1)$  and  $(n, n)$ .
  - a) Determine the values of  $a$  and  $b$  in terms of  $n$ , and then state the new equation of  $f(x)$ .
  - b) State the domain and range of  $f(x)$ .
  
2.
  - a) State the value of  $\log 10^n$ .
  - b) State the values of the following, and explain your results:
    - i)  $\log({}^1 10)$
    - ii)  $\log({}^2 10)$
    - iii)  $\log({}^3 10)$
    - iv)  $\log({}^4 10)$
    - v)  $\log({}^n 10)$

Hint: "tetration."
  
3. Write each of the following expressions as a single logarithm:
  - a)  $\log a - b + c - d$
  - b)  $a \log b + c - d$
  - c)  $\frac{\log a + b}{c \log d - f}$
  
4. Prove that if  $(j, k)$  and  $(m, n)$  are two points on the graph of  $y = \log_a x$ , then:
  - a)  $\left(\frac{j}{m}, k - n\right)$  is also a point on the graph.
  - b)  $(j^2, 2k)$  is also a point on the graph.
  - c)  $\left(\frac{1}{m}, -n\right)$  is also a point on the graph.
  
5. Consider the exponential function  $y = a^x$  and the logarithmic function  $y = \log_a x$ .
  - a) Prove that these two functions are inverses of each other.
  - b) Determine the values of  $a$  for which the two functions intersect.
  - c) What can you say about the  $x$  and  $y$  coordinates of any point(s) of intersection? State at least three facts about such point(s).