

M305G – Precalculus
Summer II 2008
Problem Set 7 – Due Friday, August 1

“No human investigation can be called real science if it cannot be demonstrated mathematically.” – Leonardo da Vinci



This problem set covers the material we’ll be discussing in class Monday, Tuesday, and Wednesday. Thursday’s material will be on another “study only” problem set that you’ll need to go over for the exam Monday next week. Friday’s material probably will not be on the exam next week; I’ll probably save it for the final.

As you can see, this problem set is **long** (50 textbook problems). I strongly recommend that you work on each section’s problems the same day we discuss the section in class!

Section 5.1: 10, 16, 27, 32, 38, 40, 66, 70.

Section 5.2: 48, 52, 56, 66.

Section 5.3: 43, 45, 63, 66, 72, 75, 100.

Section 5.4: 28, 30, 32, 34, 44, 48, 76, 84, 90, 102, 103, 109.

Section 5.5: 40, 50, 58, 60, 70, 72.

Section 5.6: 11, 13, 17, 20, 25, 29, 41, 47, 51, 55, 60, 98, 100.

Bonus Problems

B1. Write down several positive integers of different sizes, and use a calculator to find the base-10 logarithm of each number. For a positive integer N , what is the relationship between the number of digits of N and $\log N$? Use this information to determine how many digits the number $N = 13^{791} \cdot 37^{570}$ has.

B2. For what values of y does the equation

$$\frac{\log_{12}(\log_8(\log_4 x))}{\log_5(\log_4(\log_y(\log_2 x)))} = 0$$

have a solution for x ? (*Note:* This was Individual Round Problem 7 on the 2008 American Regions Math League competition.)

B3. Explain why it is incorrect to say that a sound that measures 120 decibels is twice as loud as a sound that measures 60 decibels, and give a statement that more accurately describes the relationship between the two sounds. (You may need to do some research for this.)

B4. Look up *Benford’s Law* online (again, you should be able to find enough information on Wikipedia), and explain why the following set of numbers might arouse suspicion if it appeared on a federal income tax return (say, as itemized deductions on a very wealthy person’s return):

\$2307.89, \$598.14, \$7246.93, \$19039.65, \$3088.72, \$444.11, \$960.23, \$4859.82, \$5361.41

Also, explain what Benford’s Law has to do with exponential and/or logarithmic functions.