Problem Set 2

> **Due dates:** Electronic submission of .tex and .pdf files of this homework is due on **9/11/2013 before 10:00am** on csnet.cs.tamu.edu, a signed paper copy of the pdf file is due on **9/11/2013** at the beginning of class.

Name: (put your name here)

Resources. (All people, books, articles, web pages, etc. that have been consulted when producing your answers to this homework)

On my honor, as an Aggie, I have neither given nor received any unauthorized aid on any portion of the academic work included in this assignment. Furthermore, I have disclosed all resources (people, books, web sites, etc.) that have been used to prepare this homework.

Signature: _____

As always: Watch posted videos before the next class.

Problem 1 (20 points)**.** Exercise 4.5-1a, b, c, d on page 96

Solution.

Problem 2 (30 points)**.** Exercise 3.3a on pages 61-62.

Solution.

Problem 3 (10 points)**.** Exercise 8.1-1 on page 193

Solution.

Problem 4 (10 points)**.** Exercise 8.1-4 on page 194

Solution.

Karatsuba (You can get started in class with your team on the following three questions, but the write-up needs to be from you alone).

Problem 5 (10 points)**.** Generalize Karatsubas integer multiplication algorithm to numbers with respect to a base $b \geq 2$.

Solution.

Problem 6 (10 points)**.** Use the generalized Karatsuba integer multiplication algorithm from the previous question to multiply

$$X = 1234 \qquad \text{and} \qquad Y = 8765$$

in base $b = 10$. [You can either work it out by hand or write a program and print the results each step. Note that you can create LaTeX output.]

Solution.

Problem 7 (10 points)**.** Suppose that you want to make a variation on Karatsubas algorithm and divide the integers (represented in binary) into three parts of equal length. How many multiplications can you afford to use, assuming that the combine overhead is still linear in the number n of bits of the input integers.

[**Clarification** (added 9/7/2013): You do not need to derive the algorithm. Simply derive how many multiplications can be used when splitting the integers into three parts in order to be faster than the original Karatsuba algorithm that splits the integers into two parts.]

Solution.

Discussions on piazza are always encouraged, especially to clarify concepts that were introduced in the lecture. However, discussions of homework problems on piazza should not contain spoilers. It is okay to ask for clarifications concerning homework questions if needed.

Checklist:

- ☐ Did you add your name?
- ☐ Did you disclose all resources that you have used?
  (This includes all people, books, websites, etc. that you have consulted)
- ☐ Did you sign that you followed the Aggie honor code?
- ☐ Did you solve all problems?
- ☐ Did you submit (a) your latex source file and (b) the resulting pdf file of your homework?
- ☐ Did you submit (c) a hardcopy of the pdf file in class?