Math 210

Second Hour Exam

Name _____

No calculators should be necessary for this exam
SHOW WORK

Friday, October 24
100 points

1. (10 pts.) Showing your work, use the rules for summation to find $\sum_{k=1}^{10}(2k-1)$ (use the rules and formulas for summation – credit will not be given for simply adding up all the terms.

2. (10 pts.)

   a. Give a formal definition of what it means that the function f is O(g).

   b. Give a formal definition of what it means to say that a function f is Ω(g)

(problem 2 continued)

      c.   Give a formal definition of what it means that the function f is $\Theta(g)$ (also known informally is "f is order(g)".

3.   (10 pts.) Find witnesses to demonstrate that $3n^2 + 7n + 1$ is $O(n^2)$. Show your work, and say (briefly) why the witnesses you selected work (i.e., it is not sufficient to simply write down some numbers - please give some convincing explanation about why they work.

4.   (15 pts.) Find the internal representation (two's complement) of -50. Give your (16 bit) answer in hex. Please note that this requires you to (1) find the binary representation of 50, (2) form the two's complement representation of -100, and (3) convert the resulting bit string to hexadecimal.

5. (15 pts.) Calculate in base 2 (showing work as appropriate)

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   1011
+   11
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```


```
   1001
-   11
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   1101
x101 (product)
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$101\overline{)1011101}$ (give quotient and remainder)

6.   (5 pts. each)

   a.   What does it mean to say (i.e., what is the definition of) a|b?

   b.   What is the smallest positive integer n for which $n \equiv 25 \bmod 7$ is true?

7.   (10 pts.)   Use Euclid's algorithm (or some other method) to calculate the greatest common divisor of 105 and 385

8. (15 pts.)   Suppose that x is an array of 100 integers. Write the code necessary to
    sort the array in ascending order (C, C++, or Java).

9. (5 pts.) Say something (appropriate to the course) about one of the following:

Abu Ja'far Mohammed ibn Musa Al-Khowarizmi
Paul Gustav Heinrich Bachman
Karl Friedrich Gauss
Donald Knuth
Marin Mersenne