

Homework 4

Due: October 1, 2019

Name:

1. (25 points) Two's complement representation

(a) (5 points) Compute the **one's** complement of the following binary number. Also convert the binary to hex in the box at right.

Original Number	0	0	0	0	1	1	0	1	0x0B
One's Complement	1	1	1	1	0	0	1	0	0xF2

(b) (5 points) Copy your binary one's complement number from above and add 1 to it. Convert the result from binary to hex in the box at right.

One's Complement	1	1	1	1	0	0	1	0	
+								1	
Two's Complement	1	1	1	1	0	0	1	1	0xF3

(c) (5 points) Is the original number from part 1(a) positive or negative? How do you know?

Solution: Positive because sign bit is zero.

(d) (5 points) Is the two's complement number from part 1(b) positive or negative? How do you know?

Solution: Negative because sign bit is one.

(e) (5 points) What is the decimal representation of the two's complement number from 1(b) (including the sign)?
Hint: what is the decimal representation of the original number? What happens to the sign when you take the two's complement?

Solution: -13

2. (15 points) More hex addition.

(a) (10 points) Fill in your binary two's complement result from part 1(b) and add it to $0x10 = 16_{10}$.

16_{10}	0	0	0	1	0	0	0	0	$0x10$
+	1	1	1	1	0	0	1	1	Result from 1(b)
+	0	0	0	0	0	0	1	1	$0x03$

(b) (5 points) Is this the result that you expected? Explain.

Solution: Yes this is the expected result because $16 - 13 = 3$