CS 367 Section 002 Spring 2017 - Homework #3

Due Thursday - February 16 at 3:00 pm as hard copy in class

Instructions: This is an individual homework.
We will not accept late submissions for this homework (because we will discuss the answers in class on February 16). This homework does not have a soft copy component to be submitted through *Blackboard.*
Print the homework, fill in the answers, and return to the instructor at 3:00 PM on 2/16.

1. (40 pts) Converting between representations

Fill in the tables below. If it is not possible to represent a value, explain why. Assume each number is represented by 8 bits. Use two's complement notation for signed numbers.

Decimal	Unsigned		Signed	
	Binary	Hex	Binary	Hex
78				
-89				
111				
-130				

Binary	Decimal if Unsigned	Decimal if Signed
0111 0001		
0010 1111		
1000 0100		
1111 1101		

2. (20 pts) Integer Addition

Give the 8-bit binary result for each addition of two 8 bit numbers. Considering both signed (two's complement) and unsigned arithmetic, is the result a legal number?

Then characterize each sum as one of the following four cases:

1. Correct for both signed and unsigned representations
2. Correct for signed but incorrect for unsigned representation
3. Correct for unsigned but incorrect for signed representation
4. Incorrect for both signed and unsigned representations

- 01001110 + 00010011 =
- 01011011 + 00101001 =
- 11000111 + 10111111 =
- 10110000 + 11001110 =
- 11011001 + 01100011 =

3. (40 pts) Floating Point Numbers

Assume a 12 bit floating point representation which uses the first bit as a sign bit, the next 6 for the exponent and the last 5 for the fraction. The bias is 31.
Fill in the table below ("D" stands for the decimal value).

Bit representation	exp	E	frac	M	D
0 100011 11000					
1 111000 00011					
0 000000 01010					
0		4		38/32	
					52.0
					7/32

What is the bit sequence and value for the largest possible normalized value? Explain your answer.

What is the bit sequence and value for the smallest possible (non-zero) positive normalized value? Explain your answer.

What is the bit sequence and value for the largest possible de-normalized value (do not consider $+\infty$)? Explain your answer.

What is the bit sequence and value for the smallest possible (non-zero) positive de-normalized value? Explain your answer.