

1. (a) (4 points) Consider the following eight bit binary sequence of numbers:

1010 1110

Each of the following interprets this sequence differently. For each interpretation, state if the statement is true or false. If it is false, write the correct interpretation.

$(EA)_{16}$  in hexadecimal format: False,  $(AE)_{16}$

-46 in decimal when using sign/magnitude representation: True

-81 in decimal when using two's complement representation: False, -82

174 when using unsigned representation: True

- (b) (3 points) State whether the following statements about the binary representation of numbers are *true* or *false*. Give **brief** explanations for the statements that are *false*.

- Both two's complement and one's complement representation define two zeroes, one positive and one negative.

**Solution:** False, there's only one representation for two's complement.

- Using  $N$  bits it is only possible to represent  $2^{N-1} - 1$  different numbers when a two's complement number system is used.

**Solution:** False. These are only the positive numbers, in total all numbers from  $-2^{N-1}$  to  $2^{N-1} - 1$  can be represented.

- While there are methods to represent both positive and negative integers, it is not possible to represent fractions or real numbers using binary numbers.

**Solution:** False, fixed and floating point number systems can be used to represent such numbers.