Assignment 0

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1 What is the 32-bit complement representation of the number -10117?

$$\begin{aligned} 10117_{10} &= 00000000000000000010011110000101_2 \\ \text{flip bit} &= 11111111111111111101100001111010_2 \\ \text{add 1} &= 11111111111111111101100001111011_2 \end{aligned}$$

2 Prove the following statement: Assume x and y are positive integers. If the digits of y are the digits of x, but just rearranged, then (x - y) mod 9 = 0.

Let C = some constant.
x - C = multiple of 9
Since y contains the same digits as x, y - C = multiple of 9.
(x - C - (y - C)) mod 9 = 0
(x - C - y C) mod 9 = 0
(x - y) mod 9 = 0 □

3 Is the converse of the previous statement, which you just proved, true? If so, prove it. If not, provide a concrete counterexample. In either case you must clearly state what the converse actually is.

The converse of 2 is:
if (x - y) mod 9 = 0 then the digits of y are the digits of x, but just rearranged
Counterexample:
x = 45
y = 9
(45 - 9) mod 9 = 0 however 9 is not a rearrangment of 45.