Physics 332 – Quiz 1

NAME:

4/3/4+4/4   ⑲

✓1. The address numbers in Winona county run from (presumably) 1 to about 30000. If you wanted to store addresses in a database via a binary number, how many bits wide would the number need to be to describe any of the house numbers?

2. Imagine that you're debugging a new quantum computer that stores information in base 5 ("quiniary" or "pental"). What should the result of
$$24_5 + 32_5$$
be if these two numbers are in pental and "+" implies addition? Give your answer in both pental and base 10

3. Please convert and compute the following base-10 operations in binary:
   a. 12+18
   b. 7-9 (use 8-bit base 2, 2's complement)

4. What is the base 10 equivalent of the hex number 1f?

✓1. $\lceil \log_2(30,000) \rceil = 15 \quad 2^{15} = 32768$ which is enough

2. 24_5
   32_5 ok
   $\boxed{111_5} = 1(5)_{10} + 1(25)_{10} + 1(125)_{10} = \cancel{135}_{10}$

   with markings 5^0, 5^1, 5^2 over the digits

3.a) 12 1100_2
   + 18   + 10010_2
          $\overline{11110_2} = 30_{10}$ ✓

   b.) 7 $0000\ 0111$
   + -9   + $\underline{11\ 11\ 0\ 111}$
              $11\ 11\ 1\ 110$ ✓

   (carries 111 shown above)

Convert

+9 $0000\ 1001$
1's $1111\ 0110$
2's $11\ 11\ 0111$

Check Answer

(carries $1111\ 1110$)

$\cancel{0000\ 0001}$

$1111\ 1101$
$0\ 000\ 0010_2 = 2_{10}$ ✓

So -2_{10} as expected

4. $0x1F = 1_{16}(16)_{10} + F_{16}(1)_{10}$

   $= 16_{10} + 15_{10}$

   $= 31_{10}$