Hw 4-4

√3) $-1.5625 \cdot 10^{-1}$ in half precision format

1) convert decimal to binary

$-1.5625_{10} = -1.1001_2$

$-0.15625 = 1.1001 \cdot 2^{-3}$

biased exponent $= 15 + -3 = 12 = 01100$

Thus, $\underbrace{1}_{\text{sign (1)}}011$

1110001000000000

√4) Calc $(6.875 \cdot 10^{-4} * 6.25 \cdot 10^{-4}) \times 3.75 \times 10^{2}$

a) convert binary

A $.00347 = 1.110000000 \cdot 2^{-9}$

B $4.1503906 \cdot 10^{-3} = 1.0001000000 \cdot 2^{-8}$

C $1.05625 \cdot 10^{2} = 1.1010001010 \cdot 2^{6}$

$A \cdot B = 1.1101110000\,00\,00000000$

exp $= -9 + -8 = -17$

$1.1101110000\ 00\ 00000000$

Cannot be represented in 16 bits (underflow)

√5) Consider (-21.625).

$\underbrace{1}_{\text{sign}}, \underbrace{10000011}_{\text{exponent}}, \underbrace{01011010000000000000000}_{\text{mantissa}},$

86

Convert $(-21.625)_{10} = -10101.101)_2$

normalize normalized $= -1.\boxed{010110}1 \cdot 2^{(4+127)}$ ← exponent $=$ $131_{10} = (10000011)_2$

leading 1 assumed add bias

Yes, -21.625 can be represented as $-$, 21, and .625 terminate within bit range.