

2.

a) $2^{31} + 2^{30} + 2^{29} + 2^{27} + 2^{24} + 2^{23} + 2^{22} + 2^{21} + 2^{20} + 2^{19} + 2^{16} + 2^5$
 $= 3925442560$

b) $11101001111100110000000000000000$
 $= 0001011000001100111111111111$
 $= 369524735$
 $= -369524736$

c) $\boxed{1} \boxed{11010011} \boxed{111100110000000000000000}$
 sign exponent mantissa
 $- (2^{11} - 127) = 84$
 2^{84}
 $= -37703373999231247386148864$

3.

$$20.25$$

$$= 10100.01$$

$$= 1.010001 \times 2^5 \quad 5+7=12$$

$$= \boxed{0} \boxed{1100} \boxed{01000} \boxed{0.25 \text{ lost}}$$

sign exponent mantissa

$$= \boxed{0} \boxed{1110} \boxed{01100}$$

sign exponent mantissa

$$\begin{array}{r} 1.11000 \\ + 0.11000 \\ \hline 1.00100 \end{array}$$

$$= \boxed{0} \boxed{1111} \boxed{00010} \boxed{\text{no further loss}}$$

sign mantissa

$$112.75$$

$$= 1110000.11$$

$$= 1.11000011 \times 2^7 \quad 7+7=14$$

$$= \boxed{0} \boxed{1110} \boxed{11000} \boxed{0.75 \text{ lost}}$$

sign exponent mantissa