Assignment 1

1) $(18.78125)_{10} = 2^4 + 2 + 2^{-1} + 2^{-2} + 2^{-5}$

$= (10010.11001)_2$

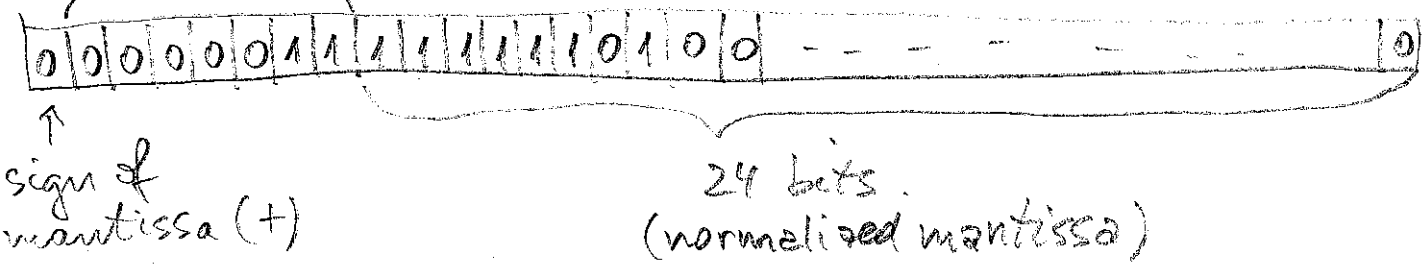
$= \boxed{(0.10010011001)_2 \times 2^5}$

2) (a) $(7.90625)_{10} = 2^2 + 2^1 + 2^0 + 2^{-1} + 2^{-2} + 2^{-3} + 2^{-5}$

$= (111.11101)_2 =$

$= +(0.11111101)_2 \times 2^3$

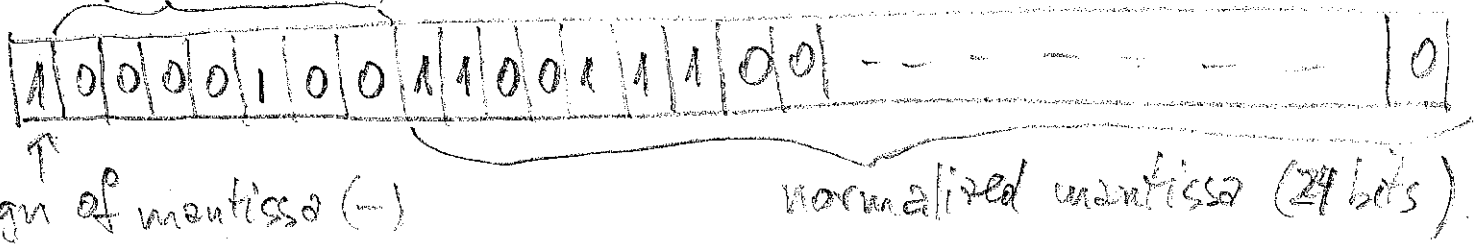
$= +(0.11111101)_2 \times 2^{(11)_2}$



(b) $(-12.875)_{10} = -(2^3 + 2^2 + 2^{-1} + 2^{-2} + 2^{-3})_{10}$

$= -(1100.111)_2 = -(0.1100111)_2 \times 2^4$

$= -(0.1100111)_2 \times 2^{(100)_2}$

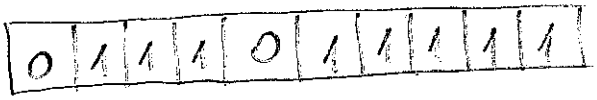


#3 $y = (-1)^u (0.\overset{\downarrow}{d_1} d_2 d_3 d_4 d_5)_2 \times 2^{(-1)^t e}$

(a) $y = (-1)^0 (0.11111)_2 \times 2^{(-1)^0 (111)_2}$

$= (0.11111)_2 \times 2^7 = (1111100)_2$

$= 2^6 + 2^5 + 2^4 + 2^3 + 2^2 = \boxed{124}$



(b)

$y = (-1)^0 (0.10110)_2 \times 2^{(-1)^0 (101)_2}$

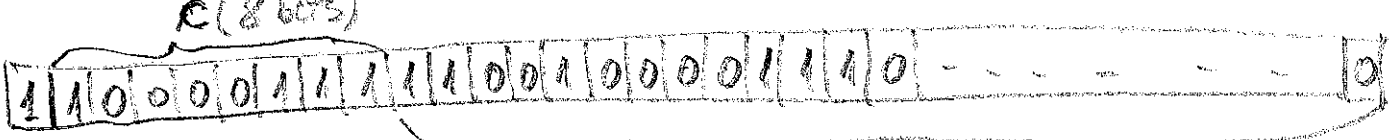
$= (0.10110)_2 \times 2^5 = (10110)_2 =$

$= 2^4 + 2^2 + 2 = \boxed{22}$

#4. $(-456.4375)_{10} = (-1)^1 \cdot (111001000.0111)_2 =$

$= (-1)^1 \cdot (1.\overbrace{11001000111}^{f})_2 \times 2^8$

$8 = c - 127 \Rightarrow c = 135 = (10000111)_2$



5) (a) $a = (-1)^1 (0.1101010\ldots)_2 \times 2^{(1010)_2}$

$= -(0.110101)_2 \times 2^{10} = -(1101010000)_2$

$= \boxed{-848}$

(b) $b = (-1)^0 (0.100001010\ldots0)_2 \times 2^{(110)_2}$

$= (0.1000101)_2 \times 2^6 = (100010.1)_2$

$= \boxed{34.5}$

(C) $c = (-1)^1 (0.110110\ldots0)_2 \times 2^{(1110)_2}$

$= -(0.110110\ldots0)_2 \times 2^{14}$

$= -\left(\frac{1}{2} + \frac{1}{4} + \frac{1}{16} + \frac{1}{32}\right) \times 2^{14}$

$= -13,824$

6) $fl(x)_{\text{round.}} = 0.86440$

$fl(y) = 0.86433$

(a) $fl(x) + fl(y) = 1.7287 = (0.17287)_{10} \times 10^{1}$

$$\text{Relative error} = \frac{|x+y - (fl(x) + fl(y))|}{|x+y|}$$

$$\simeq 1.7868599 \times 10^{-5}$$

(b) $fl(x) \cdot fl(y) = 0.74713$

$$\text{Relative error} = \frac{|x \cdot y - fl(x) \cdot fl(y)|}{|x \cdot y|}$$

$$\simeq 3.1836522 \ldots 10^{-6}$$

7) $f(x) = \ln(1-x)$

$$f(x) \simeq f(0) + \frac{f'(0)}{1!}x + \frac{f''(0)}{2!}x^2$$

$$f'(x) = \frac{-1}{1-x} = \frac{1}{x-1}$$

$$f''(x) = -\frac{1}{(x-1)^2}$$

$$f(0) = \ln(1-0) = \ln 1 = 0$$

$$f'(0) = -1 \; ; \; f''(0) = -1$$

$$f(0.5) = \ln 0.5 \simeq 0 + \frac{-1}{1!}0.5 + \frac{-1}{2!}0.5^2$$

$$\simeq -0.625$$

8) $X = [-2,1] \div [2,4] = [-2,1] \cdot [\frac{1}{4}, \frac{1}{2}]$

$$= [-1, \frac{1}{2}]$$

9) $f([-1,1],[-1,1],[1,2]) = [-1,1] \cdot [-1,1] + [1,2]$

$$= [-1,1] + [1,2]$$

$$= [0,3]$$

10) $[-1,0] \div [1,2] + [-2,3] \cdot [4,5] =$

$= [-1,0] \cdot [\frac{1}{2}, 1] + [-2,3] \cdot [4,5]$

$= [-1,0] + [-10,15] = [-11,15]$