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HW set #1  
2-2 #6, #8, #10

6. a)

$$\begin{array}{r} 1 \ 1 \ 1 \ 0 \\ \downarrow \downarrow \downarrow \downarrow \\ 8 \ 4 \ 2 \ 1 \\ \boxed{14} \end{array}$$

$$\begin{array}{r} 1 \ 1 \ 1 \ 0 \ 1 \\ \downarrow \downarrow \downarrow \downarrow \downarrow \\ 16 \ 8 \ 4 \ 2 \ 1 \\ \boxed{29} \end{array}$$

b)

$$\begin{array}{r} 1 \ 0 \ 1 \ 0 \\ \downarrow \downarrow \downarrow \downarrow \\ 8 \ 4 \ 2 \ 1 \\ \boxed{10} \end{array}$$

$$\begin{array}{r} 1 \ 0 \ 1 \ 1 \ 1 \\ \downarrow \downarrow \downarrow \downarrow \\ 16 \ 8 \ 4 \ 2 \ 1 \\ \boxed{23} \end{array}$$

c)

$$\begin{array}{r} 1 \ 1 \ 1 \ 0 \ 0 \\ \downarrow \downarrow \downarrow \downarrow \downarrow \\ 16 \ 8 \ 4 \ 2 \ 1 \\ \boxed{28} \end{array}$$

$$\begin{array}{r} 1 \ 1 \ 1 \ 1 \ 1 \\ \downarrow \downarrow \downarrow \downarrow \downarrow \\ 16 \ 8 \ 4 \ 2 \ 1 \\ \boxed{31} \end{array}$$

d)

$$\begin{array}{r} 1 \ 0 \ 0 \ 0 \ 0 \\ \downarrow \downarrow \downarrow \downarrow \downarrow \\ 16 \ 8 \ 4 \ 2 \ 1 \\ \boxed{16} \end{array}$$

e)

$$\begin{array}{r} 1 \ 0 \ 1 \ 0 \ 1 \\ \downarrow \downarrow \downarrow \downarrow \downarrow \\ 16 \ 8 \ 4 \ 2 \ 1 \\ \boxed{21} \end{array}$$

a) 11  
 $2^2 - 1 = \boxed{3}$

i) 1111111111  
 $2^{10} - 1 = 1023$

b) 111  
 $2^3 - 1 = \boxed{7}$

j) 1111111111  
 $2^{11} - 1 = 2047$

c) 1111  
 $2^4 - 1 = \boxed{15}$

d) 11111  
 $2^5 - 1 = \boxed{31}$

e) 111111  
 $2^6 - 1 = 63$

f) 1111111  
 $2^7 - 1 = \boxed{127}$

g) 1111111111  
 $2^8 - 1 = \boxed{255}$

h) 1111111111  
 $2^9 - 1 = \boxed{511}$

10. a)

0	0
1	1
10	2
11	3
100	4
101	5
110	6
111	7

c)

10000	16
10001	17
10010	18
10011	19
10100	20
10101	21
10110	22

b)

1000	8
1001	9
1010	10
1011	11
1100	12
1101	13
1110	14
1111	15

10110	23
11000	24
11001	25
11010	26
11011	27
10100	28
11101	29
11110	30
11111	31

d)

100000	32
100001	33
100010	34
100011	35
100100	36
100101	37
100110	38
100111	39
101000	40
101001	41
101010	42
101011	43
101100	44
101101	45
101110	46
101111	47
110000	48
110001	49
110010	50
110011	51
110100	52
110101	53
110110	54
110111	55
111000	56
111001	57
111010	58
111011	59
111100	60

e)

10000000	64
10000001	65
10000010	66
10000011	67
10001000	68
10001001	69
10001100	70
10001111	71
10010000	72
10010011	73
10010101	74
10010111	75

61	111101
62	111110
63	111111

2-3 #13

a)  $2\sqrt{15}$

$$\begin{array}{r} 14 \\ \hline 2\sqrt{15} \\ -14 \\ \hline 10 \end{array}$$

$$\begin{array}{r} 3 & 1 & 7 \\ 2\sqrt{7} & 2\sqrt{3} \\ -6 & -2 \\ \hline 1 & 1 \\ 2\sqrt{1} & -0 \\ \hline -0 \end{array}$$

11111

b)  $2\sqrt{21}$   $2\sqrt{10}$

$$\begin{array}{r} 10 & 5 \\ 2\sqrt{21} & 2\sqrt{10} \\ -20 & -10 \\ \hline 1 & 0 \\ 2\sqrt{5} & 2\sqrt{2} & 2\sqrt{1} \\ -4 & -2 & -0 \\ \hline 1 & 0 & 1 \end{array}$$

10101

c)  $2\sqrt{28}$   $2\sqrt{14}$   $2\sqrt{7}$

$$\begin{array}{r} 14 & 7 & 3 \\ 2\sqrt{28} & 2\sqrt{14} & 2\sqrt{7} \\ -28 & -14 & -6 \\ \hline 0 & 0 & 1 \\ 2\sqrt{3} & 2\sqrt{1} & -2 \\ -2 & -0 & 1 \\ \hline 1 & 1 & 0 \end{array}$$

11100

d)  $2\sqrt{34}$   $2\sqrt{17}$

$$\begin{array}{r} 17 & 8 \\ 2\sqrt{34} & 2\sqrt{17} \\ -34 & -16 \\ \hline 0 & 1 \\ 2\sqrt{8} & 2\sqrt{4} \\ -8 & -4 \\ \hline 0 & 0 \\ 2\sqrt{2} & 2\sqrt{1} \\ -2 & -0 \\ \hline 0 & 1 \end{array}$$

100010

e)  $2\sqrt{40}$   $2\sqrt{20}$

$$\begin{array}{r} 20 & 10 \\ 2\sqrt{40} & 2\sqrt{20} \\ -40 & -20 \\ \hline 0 & 0 \\ 2\sqrt{5} & 2\sqrt{5} \\ -10 & -9 \\ \hline 0 & 1 \\ 2\sqrt{2} & 2\sqrt{1} \\ -2 & -0 \\ \hline 0 & 1 \end{array}$$

1000001

f)  $2\sqrt{59}$   $2\sqrt{29}$

$$\begin{array}{r} 29 & 14 \\ 2\sqrt{59} & 2\sqrt{29} \\ -58 & -28 \\ \hline 1 & 0 \\ 2\sqrt{14} & 2\sqrt{7} \\ -14 & -7 \\ \hline 0 & 1 \\ 2\sqrt{3} & 2\sqrt{1} \\ -3 & -2 \\ \hline 0 & 1 \end{array}$$

101100

g)  $2\sqrt{65}$   $2\sqrt{32}$

$$\begin{array}{r} 32 & 16 \\ 2\sqrt{65} & 2\sqrt{32} \\ -64 & -32 \\ \hline 0 & 0 \\ 2\sqrt{8} & 2\sqrt{8} \\ -8 & -8 \\ \hline 0 & 0 \\ 2\sqrt{4} & 2\sqrt{2} \\ -4 & -2 \\ \hline 0 & 0 \\ 2\sqrt{1} & -0 \\ \hline 1 & \end{array}$$

1000001

h)  $2\sqrt{73}$   $2\sqrt{36}$

$$\begin{array}{r} 36 & 18 \\ 2\sqrt{73} & 2\sqrt{36} \\ -72 & -36 \\ \hline 9 & 0 \\ 2\sqrt{9} & 2\sqrt{9} \\ -18 & -18 \\ \hline 0 & 0 \\ 2\sqrt{4} & 2\sqrt{2} \\ -4 & -2 \\ \hline 0 & 0 \\ 2\sqrt{1} & -0 \\ \hline 1 & \end{array}$$

1001001

i)  $2\sqrt{59}$   $2\sqrt{29}$

$$\begin{array}{r} 29 & 14 \\ 2\sqrt{59} & 2\sqrt{29} \\ -58 & -28 \\ \hline 1 & 0 \\ 2\sqrt{14} & 2\sqrt{7} \\ -14 & -7 \\ \hline 0 & 1 \\ 2\sqrt{3} & 2\sqrt{1} \\ -3 & -2 \\ \hline 0 & 1 \end{array}$$

1001001

ls. a)  $2^{-4} \# 15$

$$\begin{array}{r} 11 \\ + 01 \\ \hline \boxed{1100} \end{array}$$

e)  $1001 + 101$

$$\begin{array}{r} 1001 \\ + 101 \\ \hline \boxed{1110} \end{array}$$

b)  $10 + 10$

$$\begin{array}{r} 10 \\ + 10 \\ \hline \boxed{1100} \end{array}$$

f)  $1101 + 1011$

$$\begin{array}{r} 1101 \\ + 1011 \\ \hline \boxed{11000} \end{array}$$

c)  $101 + 11$

$$\begin{array}{r} 101 \\ + 11 \\ \hline \boxed{1000} \end{array}$$

d)  $111 + 110$

$$\begin{array}{r} 111 \\ + 110 \\ \hline \boxed{1101} \end{array}$$

2-5 # 19

19.  $\begin{array}{r} 100000000 \\ 000000000 \end{array}$   $\boxed{= 0}$

2-6 #28, #29

28 a)  $\begin{array}{r} 1001100 \\ - \end{array}$  2<sup>nd</sup> complement

$\begin{array}{r} 1001100 \\ - \end{array}$  1<sup>st</sup> complement

$\begin{array}{r} 01100111 \\ \downarrow \downarrow \quad \downarrow \downarrow \downarrow \\ 64 32 \quad 421 \\ +103 \end{array}$  Binary

b)  $\begin{array}{r} 01110 \\ - \end{array}$  2<sup>nd</sup> complement

$\begin{array}{r} 01110011 \\ - \end{array}$  1<sup>st</sup> complement

$\begin{array}{r} 10001100 \\ \downarrow \quad \downarrow \downarrow \downarrow \\ 128 \quad 84 \\ -12 \end{array}$  Binary

$\boxed{-12}$

c)  $\begin{array}{r} 1011111 \\ - \end{array}$  2<sup>nd</sup> complement

$\begin{array}{r} 1011110 \\ - \end{array}$  1<sup>st</sup> complement

$\begin{array}{r} 01000001 \\ \downarrow \quad \downarrow \\ 64 \quad 1 \end{array}$  Binary

$\boxed{65}$

29. a) 0.11110000101011

$$0.11110000101011 \times 2^{15}$$

$$127 + 15 = 142$$

$$\begin{array}{r} 71 \\ 2\sqrt{142} \\ -142 \\ \hline 0 \end{array} \quad \begin{array}{r} 35 \\ 2\sqrt{71} \\ -70 \\ \hline 1 \end{array} \quad \begin{array}{r} 17 \\ 2\sqrt{35} \\ -34 \\ \hline 1 \end{array} \quad \begin{array}{r} 8 \\ 2\sqrt{17} \\ -16 \\ \hline 1 \end{array} \quad \begin{array}{r} 4 \\ 2\sqrt{8} \\ -8 \\ \hline 0 \end{array} \quad \begin{array}{r} 2 \\ 2\sqrt{4} \\ -4 \\ \hline 0 \end{array} \quad \begin{array}{r} 1 \\ 2\sqrt{2} \\ -2 \\ \hline 0 \end{array}$$

10001110

[0]10001110[01111100000101011000000000

b) 100110000011000

$$1,00110000011000 \times 10^{14}$$

$$127 + 14 = 141$$

$$\begin{array}{r} 70 \\ 2\sqrt{141} \\ -140 \\ \hline 1 \end{array} \quad \begin{array}{r} 35 \\ 2\sqrt{70} \\ -70 \\ \hline 0 \end{array} \quad \begin{array}{r} 17 \\ 2\sqrt{35} \\ -34 \\ \hline 1 \end{array} \quad \begin{array}{r} 8 \\ 2\sqrt{17} \\ -16 \\ \hline 1 \end{array} \quad \begin{array}{r} 4 \\ 2\sqrt{8} \\ -8 \\ \hline 0 \end{array} \quad \begin{array}{r} 2 \\ 2\sqrt{4} \\ -4 \\ \hline 0 \end{array} \quad \begin{array}{r} 1 \\ 2\sqrt{2} \\ -2 \\ \hline 0 \end{array}$$

10001101

[1]10001101[10011000001100000000000000