3.4.

(1) 解：$[x]_补=00.11010$，$[y]_补=00.10111$

$$\begin{array}{rl} [x]_补 & 00.11010 \\ +[y]_补 & 00.10111 \\ \hline [x+y]_补 & 01.10001 \end{array}$$

发生了正上溢

(2) 解：$[x]_补=00.11101$，$[y]_补=11.01100$

$$\begin{array}{rl} [x]_补 & 00.11101 \\ +[y]_补 & 11.01100 \\ \hline [x+y]_补 & 00.01001 \end{array}$$

没有发生溢出

$[x+y]=00.01001$

(3) 解：$[x]_补=11.01001$，$[y]_补=11.01000$

$$\begin{array}{rl} [x]_补 & 11.01001 \\ +[y]_补 & 11.01000 \\ \hline [x+y]_补 & 10.10001 \end{array}$$

发生了负上溢

3.5

(1) 解：$[x]_{补} = 00.11011$，$[-y]_{补} = 11.00011$

$$
\begin{array}{lr}
[x]_{补} & 00.11011 \\
+[-y]_{补} & 11.00011 \\
\hline
[x-y]_{补} & 11.11110
\end{array}
$$

没有发生溢出

$\therefore\ x-y = -00.00010$

(2) 解：$[x]_{补} = 00.10111$　$[-y]_{补} = 11.00010$

$$
\begin{array}{lr}
[x]_{补} & 00.10111 \\
+[-y]_{补} & 11.00010 \\
\hline
[x-y]_{补} & 11.11001
\end{array}
$$

没有发生溢出

$\therefore\ x-y = -00.00111$

(3) 解：$[x]_{补} = 11.00001$　$[-y]_{补} = 00.11001$

$$
\begin{array}{lr}
[x]_{补} & 11.00001 \\
+[-y]_{补} & 00.11001 \\
\hline
[x-y]_{补} & 11.11010
\end{array}
$$

没有发生溢出

$\therefore\ x-y = -00.00110$

3.6 $x=-0.11111$ $y=0.11101$

(1)解：由原码位乘法方法有

部分积	乘数 $\lvert y \rvert$
00.00000	11101
+00.11111	
00.11111	11101
→00.01111	11110
+00.00000	
00.01111	11110
→00.00111	11111
+00.11111	
01.00110	11111
→00.10011	01111
+00.11111	
01.10010	01111
→00.11001	00111
+00.11111	
01.11000	00111
→00.11100	00011

又 $P_f = x_0 \oplus y_0 = 0 \oplus 1 = 1$

因此

$[x \times y]_{原} = 1.1110000011$

$x \times y = -0.1110000011$

3.7 $x = -0.011010$ $y = -0.011101$

解 由补码一位乘法方法有

$[x]_补 = 1.100110$ $[-x]_补 = 0.011010$

$[y]_补 = 1.100011$

部分积	乘数y	
00.000000	11000110	
+ 00.011010		+ [-x]补
00.011010		
→ 00.001101	01100011	+0
+ 00.000000		
00.001101		
→ 00.000110	10110001	+ [x]补
+ 11.100110		
11.101100		
→ 11.110110	01011000	+ 0
+ 00.000000		
11.110110		
→ 11.111011	00101100	+0
+ 00.000000		
11.111011		
→ 11.111101	1.0010110	+ [-x]补
+ 00.011010		
00.010111		
→ 00.001011	11001011	+0
+ 00.000000		所以 x×y = 0.1011110010
00.001011	11001011	

所以 $[x \times y]_补 = 0.001011110010$

3-8 $x = -0.10101$ $y = 0.11000$

解: $[x]_原 = 1.10101$ $[y]_原 = 0.11000$.

$[|y|]_补 = 0.11000$ $[-|y|]_补 = 1.01000$

	余数 R	商 Q	
	00.10101	0.00000	
$+[-\|y\|]_补$	11.01000		
	11.11101	0.00000	$R_1<0$ 商上0
←	11.11010	0.0000	
$+\|y\|$	00.11000		
	00.10010	0.00001	$R_1>0$ 商上1
←	01.00100	0.0001	
$+[-\|y\|]_补$	11.01000		
	00.01100	0.00011	$R_1>0$ 商上1
←	00.11000	0.0011	
$+[-\|y\|]_补$	11.01000		
	00.00000	0.00111	$R_1>0$ 商上1
←	00.00000	0.0111	
$+[-\|y\|]_补$	11.01000		
	11.01000	0.01110	
←	10.10000	0.1110	
$+\|y\|$	00.11000		
	11.01000	0.11100	

由于余数为负 加|y|后恰为0 且符号位 $x_0 \oplus y_0 = 0 \oplus 1 = 1$

所以 $[x \div y]_原 = [Q]_原 = 1.11100$ 余数 $R = 0$

补 2.6125×10^{1}

$4.150390625 \times 10^{-1}$

解 先将两数转化为 IEEE 754-2008 半精度

对 $2.6125 \times 10^{1} = 26.125$

$$\begin{array}{rl} 0.125 & \\ \times\ \ 2 & \\ \hline 0.250 & 0 \\ \times\ \ 2 & \\ \hline 0.500 & 0 \\ \times\ \ 2 & \\ \hline 1.000 & 1 \end{array} \qquad \begin{array}{r|ll} 2 & 26 & 0 \\ 2 & 13 & 1 \\ 2 & 6 & 0 \\ 2 & 3 & 1 \\ 2 & 1 & 1 \\ & 0 & \end{array}$$

$\therefore (26.125)_{10} = (11010.001)_2$

移动小数点，有 1.1010001×2^{4}

$S=0 \quad E = e+16 = 20 = 10100$

$M = 1010001$

$\therefore$ 26.125 用半精度表示为 0 10100 1010000000

对 $4.150390625 \times 10^{-1} = 0.4150390625$

$$\begin{array}{rl} 0.4150390625 & \\ \times\ \ 2 & \\ \hline 0.8300792500 & 0 \\ \times\ \ 2 & \\ \hline 1.6601585000 & 1 \\ \times\ \ 2 & \\ \hline 1.320317 & 1 \\ \times\ \ 2 & \\ \hline 0.640634 & 0 \\ \times\ \ 2 & \\ \hline 1.281268 & 1 \\ \times\ \ 2 & \\ \hline \end{array} \qquad \begin{array}{rl} 0.562536 & 0 \\ \times\ \ 2 & \\ \hline 1.125072 & 1 \\ \times\ \ 2 & \\ \hline 0.250144 & 0 \\ \times\ \ 2 & \\ \hline 0.500288 & 0 \\ \times\ \ 2 & \\ \hline 1.000576 & 1 \\ \times\ \ 2 & \\ \hline 0.001152 & 0 \\ 0.002304 & 0 \end{array}$$

$\therefore (4.150390625 \times 10^{-1})_{10}$

$= (0.011010100100\cdots)_2$

$= 1.1010100100 \times 2^{-2}$

$S = 0 \quad E = e+16 = 14$

$= 01110$

∴ $4.150390625 \times 10^{-1}$ 半精度表示为

0 01110 1010100100

运算 ① 对阶

$X = 2.6125 \times 10^{1} = 1.101000 1 \times 2^{4}$

$Y = 4.150390625 \times 10^{-1} = 1.1010100100 \times 2^{-2}$

X阶比Y大6 将Y尾数右移6位阶码同时阶码加6

对阶后 Y = 0 10100 0000001010 $\boxed{100100}$

其附加位为 101

X	0 10100 1010 000000
Y	0 10100 0000001010
X+Y	0 10100 1010 001010

尾数为1.0100 01010 无需规格化.