Detect Overflow

Input				Signs			Output
SUBTRACT	A_MSB	B_MSB	SUM_MSB	A_sign	B_sign	Sum_sign	OVERFLOW
0	0	0	0	+	+	+	0
0	0	0	1	+	+	−	1
0	0	1	0	+	−	+	0
0	0	1	1	+	−	−	0
0	1	0	0	−	+	+	0
0	1	0	1	−	+	−	0
0	1	1	0	−	−	+	1
0	1	1	1	−	−	−	0
1	0	0	0	+	+	+	0
1	0	0	1	+	+	−	0
1	0	1	0	+	−	+	0
1	0	1	1	+	−	−	1
1	1	0	0	−	+	+	1
1	1	0	1	−	+	−	0
1	1	1	0	−	−	+	0
1	1	1	1	−	−	−	0

$$\text{OVERFLOW} = \bar{A}\bar{B}\,\overline{\text{SUBTRACTION}}\,\text{SUM} + A\bar{B}\,\overline{\text{SUBTRACTION}}\,\overline{\text{SUM}} + \bar{A}B\,\text{SUBTRACTION}\,\text{SUM} + AB\,\text{SUBTRACTION}\,\overline{\text{SUM}}$$

$$= \bar{A}\,\text{SUM}(\bar{B}\,\overline{\text{SUBTRACTION}} + B\,\text{SUBTRACTION}) + A\,\overline{\text{SUM}}(B\,\overline{\text{SUBTRACTION}} + \bar{B}\,\text{SUBTRACTION})$$

$$= \bar{A}\,\text{SUM}(B \text{ XNOR } \text{SUBTRACTION}) + A\,\overline{\text{SUM}}(B \text{ XOR } \text{SUBTRACTION})$$