3. The original binary number is denoted as

$(x_n \dots x_2\ x_1\ x_0)_2$, where $x_k = 0$ or 1.

By complementing all bits we get

$(y_n \dots y_2\ y_1\ y_0)_2$, where $x_k + y_k = 1$.

Adding one means adding number

$(0 \dots 0\ 0\ 1)_2$

Adding all three numbers means

$$
\begin{array}{r}
(x_n \dots x_2\ x_1\ x_0)_2 \\
(y_n \dots y_2\ y_1\ y_0)_2 \\
+\ (0 \dots 0\ 0\ 1)_2 \\
\hline
\end{array}
$$

The rightmost column $x_0 + y_0 + 1$ is 0 and an overflow bit moves left.

The second column from right, $x_1 + y_1 + 1$, where 1 is the previous overflow bit equals to 0 and an overflow bit moves left.

The k:th column is similar, $x_k + y_k + 1$ equals to 0 and an overflow bit moves left.

Therefore, only the $(n+1)$:th column equals to 1 (last overflow) and all other bits are zero.

$(n+1)$ is a sign bit, therefore

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$$\underline{(x_n \dots x_2\ x_1\ x_0)_2 + (y_n \dots y_2\ y_1\ y_0)_2 = 0}\ \therefore$$