11.2 Overflow for signed numbers only occurs when adding numbers with the same sign (positive or negative). The numbers overflow ($V$) if the sign of the result $Y$ does not match the sign of the inputs $A$ and $B$:

$$V = A_{N-1}B_{N-1}Y_{N-1} + \overline{A}_{N-1}\overline{B}_{N-1}Y_{N-1}$$

The first term is the case where both inputs are negative (MSB=1) but the output is positive. The second is where both inputs are positive but the output is negative.

11.7 Here’s the original Sklansky adder. The red line indicates the relevant part of the critical path. The gray cells circled in blue are off the critical path, but they add to the fanout, load down the cells that drive them, and so slow down the critical path delay.

To speed up the critical path delay, the critical path is isolated from the loading of these non-critical cells by buffers.