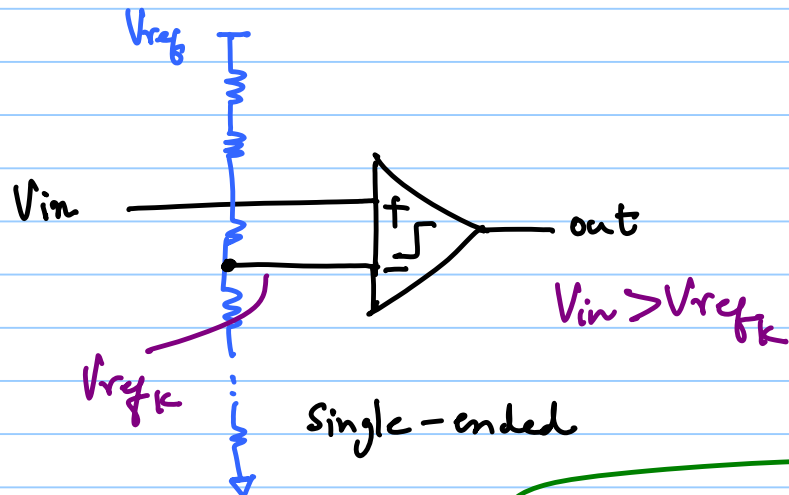


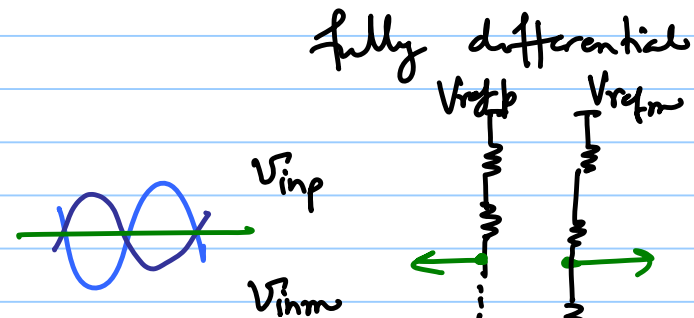
ECE 517 - Lecture 10

Note Title

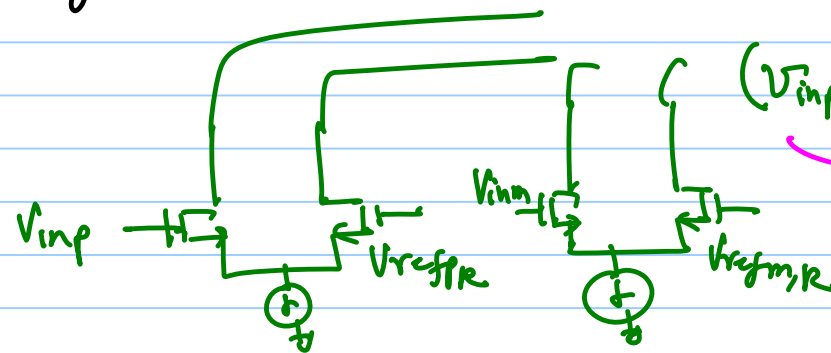
2/16/2017



Single-ended



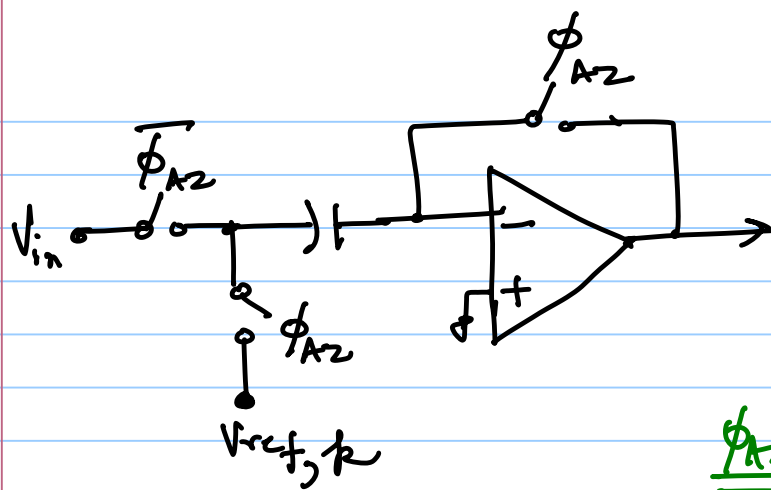
fully differential



reference subtraction

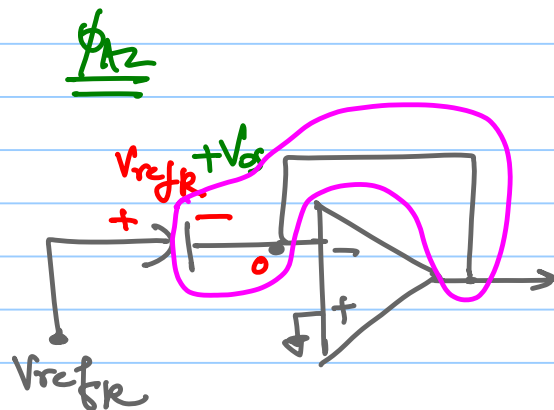
$$(V_{inp} - V_{refp,k}) > (V_{inm} - V_{refm,k})$$

Dual diff-pair

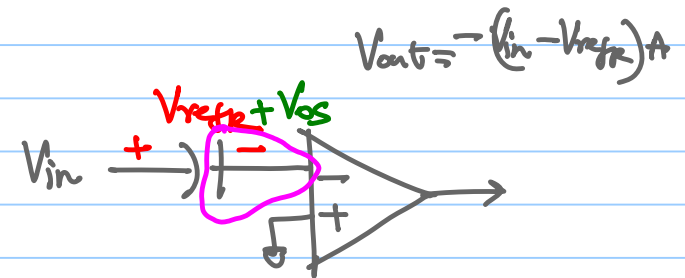


$\phi_{A2}=1 \Rightarrow$ Store the effect of the reference

$\phi_{A2} \Rightarrow$ Amplification & reference subtraction as well as offset cancellation

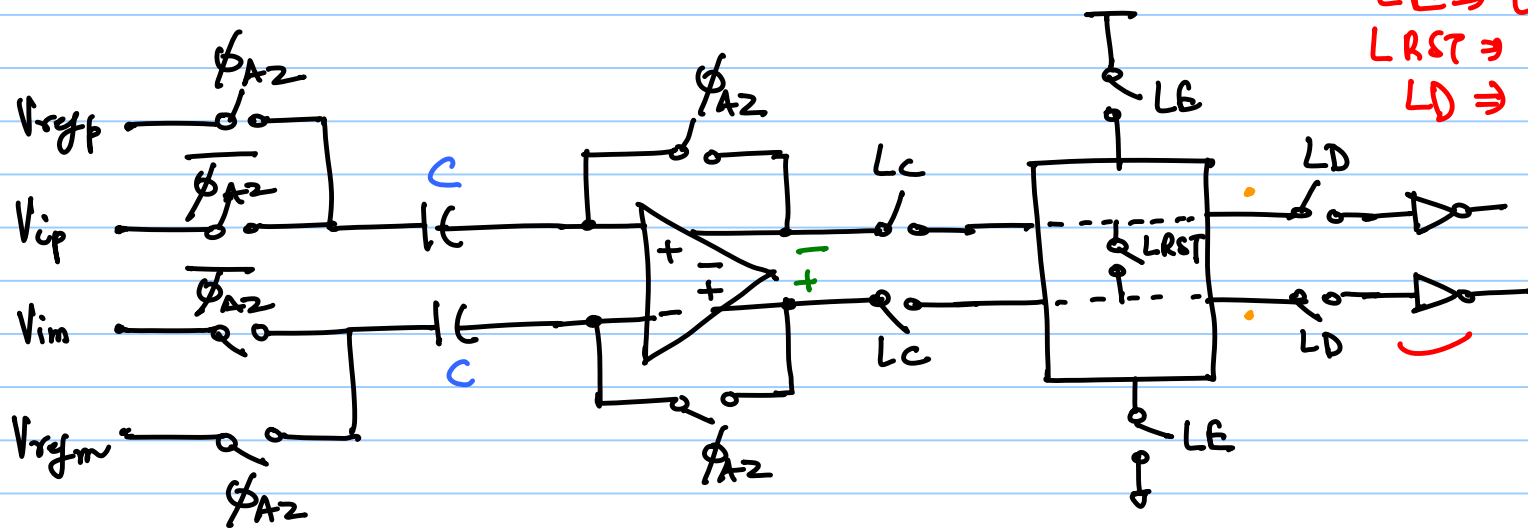


ϕ_{A2}



$$V_{out} = -(V_{in} - V_{ref})A$$

Sense-Amp Based Comparator



ϕ_{A2} $\overline{\phi_{A2}}$

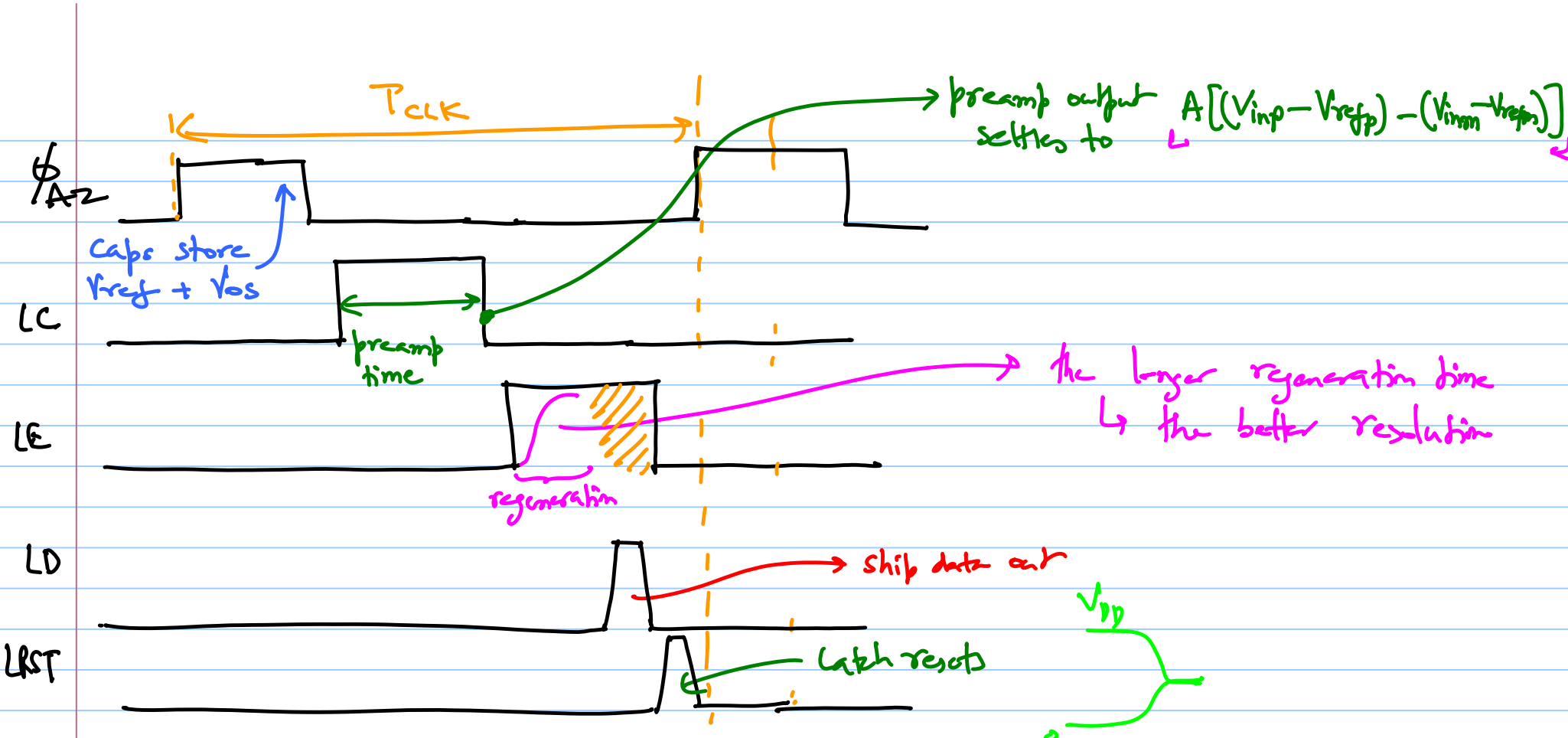
$LC \Rightarrow$ Latch Connect

$LE \Rightarrow$ Latch Enable

$LRST \Rightarrow$ Latch Reset

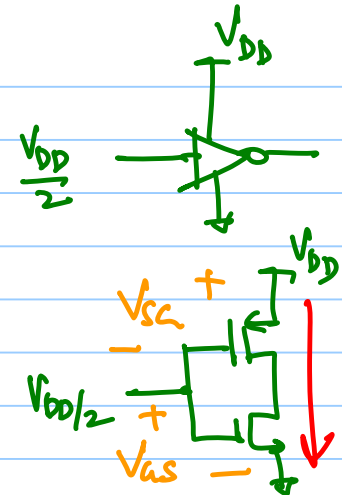
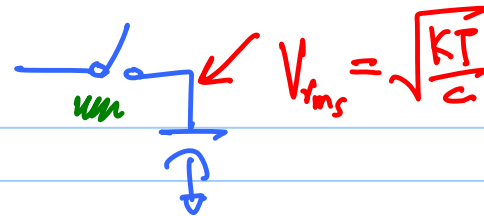
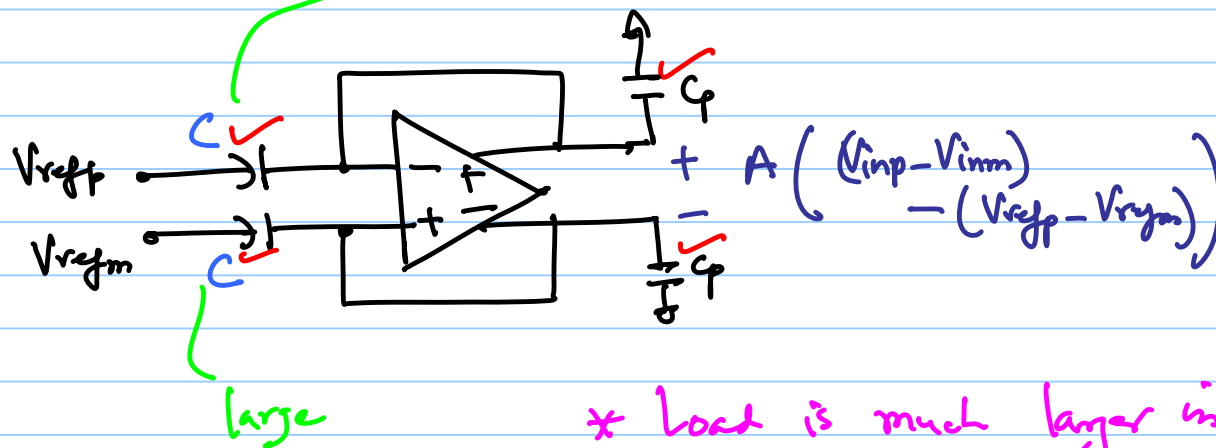
$LD \Rightarrow$ Latch delayed
(to hold the data)

Data out



ϕ_{A2}

Noise



* Load is much larger in the ϕ_{A2} phase
 $\therefore$ time-constant is large

* Limit the comparator speed $\rightarrow$ ADC speed

① Perform AZ less frequently $\Rightarrow$ Caps can store $V_{ref} + V_{os}$ for several ms.

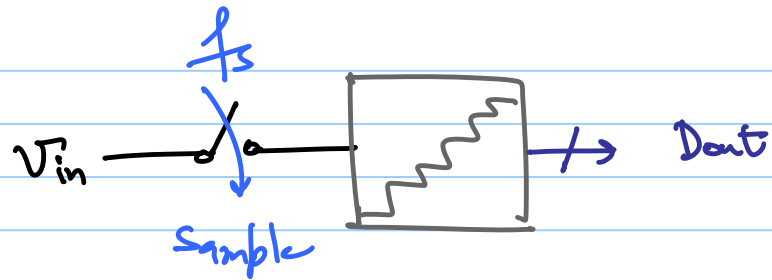
$\rightarrow$ AZ once per several 1000's of cycles

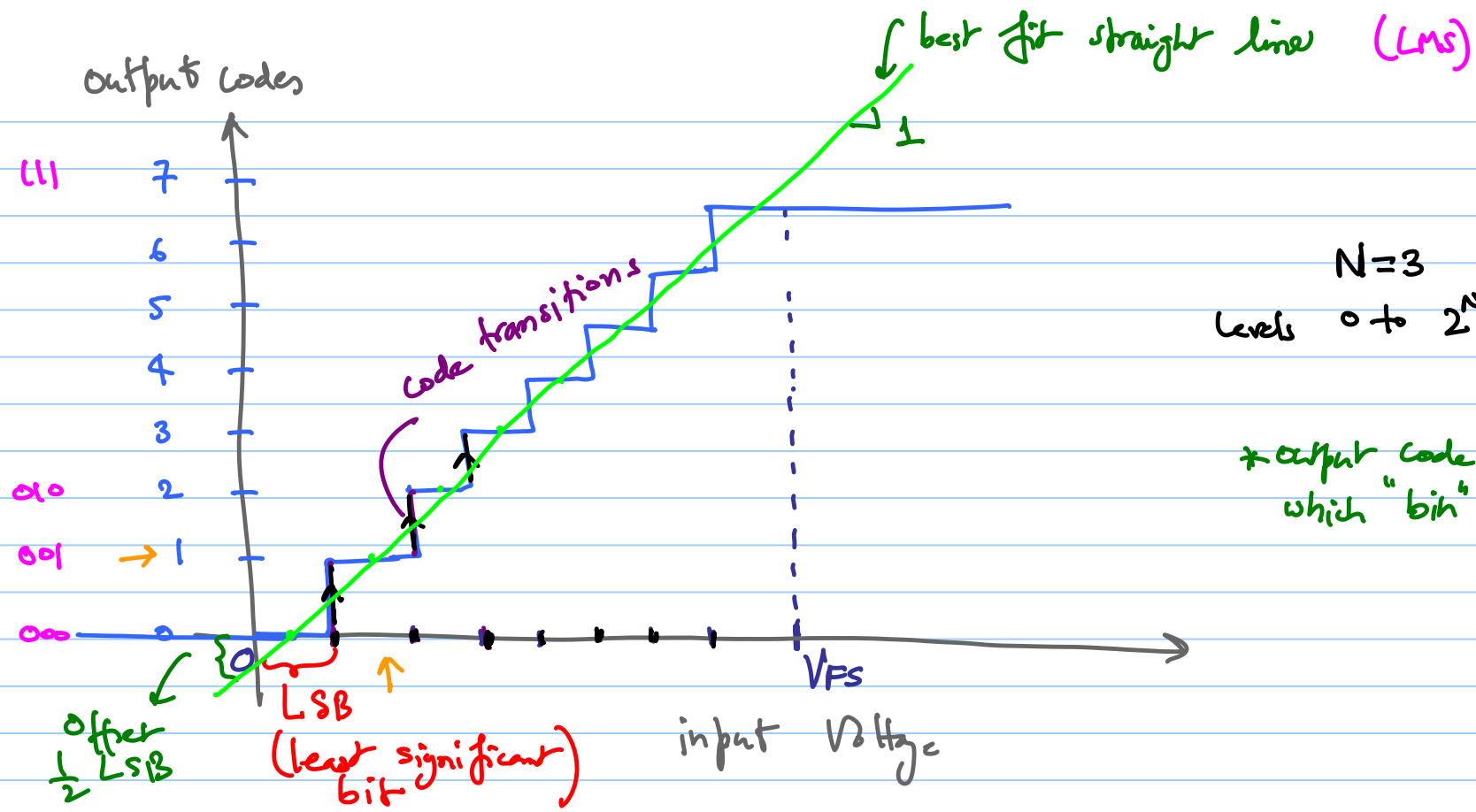
② Background offset correction

15 comparators + 1 extra

③ foreground offset correction

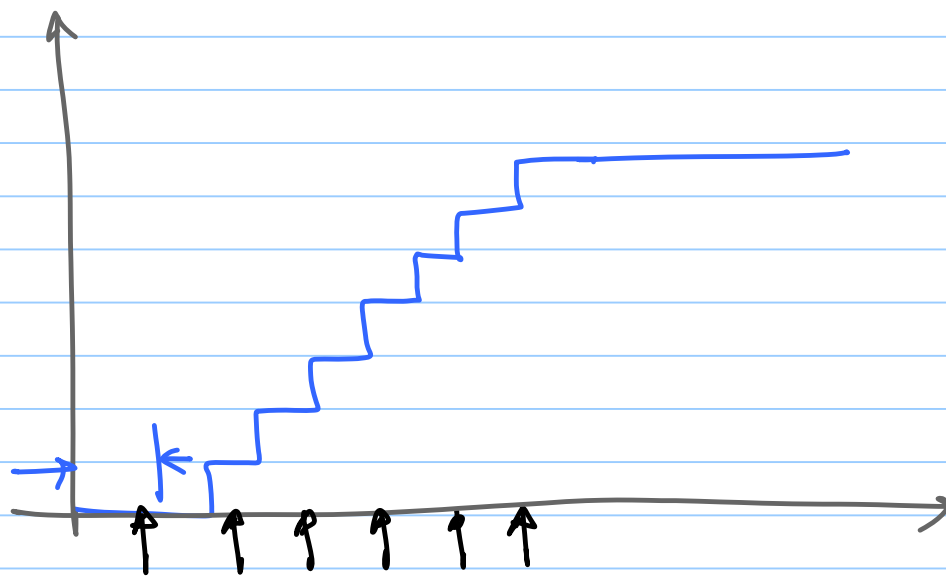
ADC



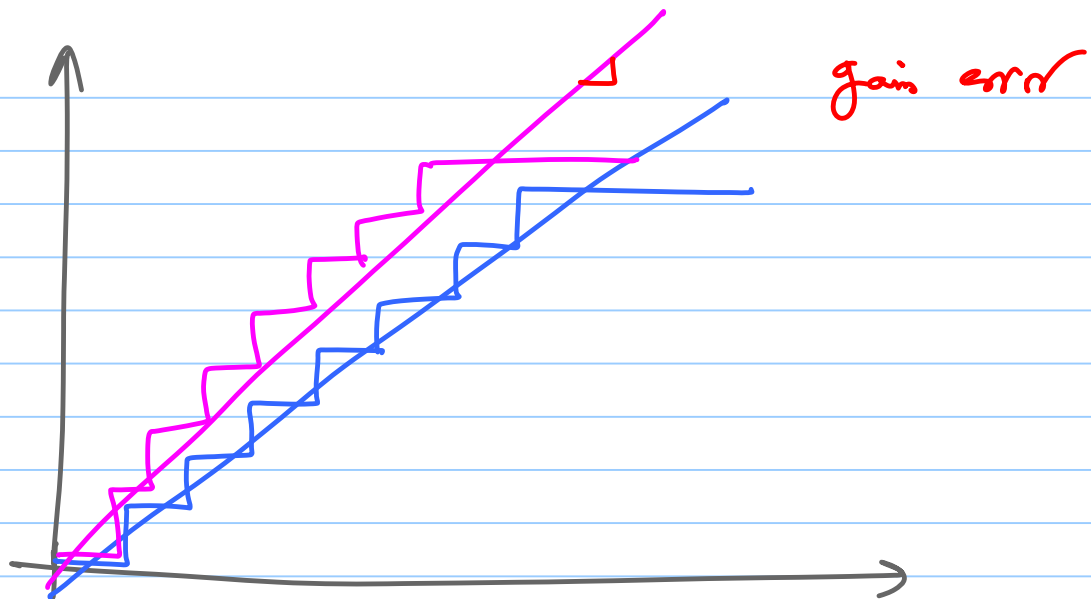


$N=3$
levels 0 to $2^{N-1} \Rightarrow 0 \rightarrow 7$

* output code tells in which "bin" the input falls



offer end



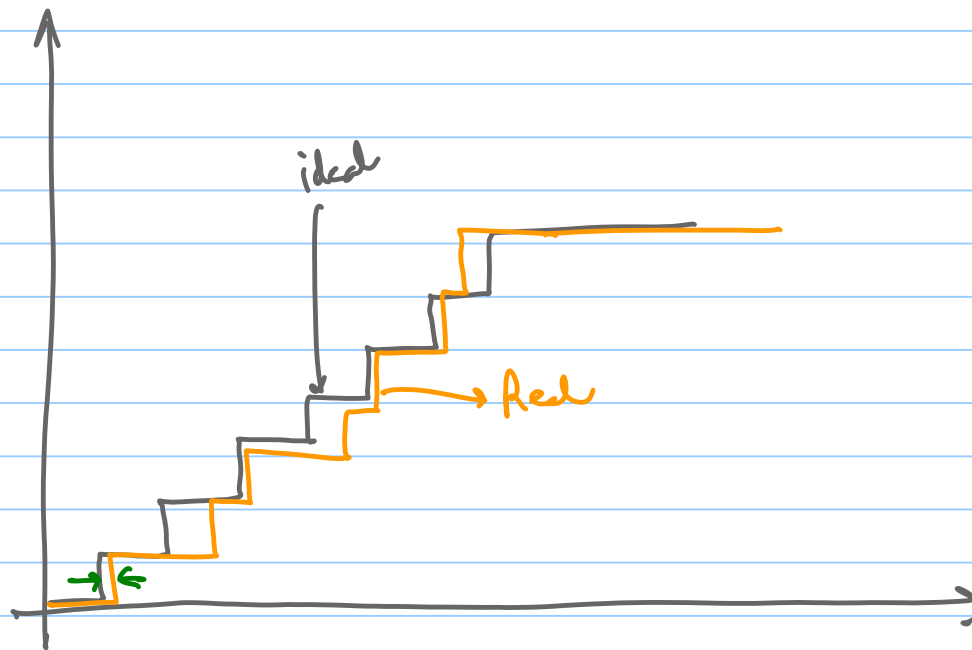
Differential Nonlinearity "DNL"

Width of code

$$"0" \Rightarrow (1 + \varepsilon_0) \text{ LSB}$$

$$"1" \Rightarrow (1 - \varepsilon_1) \text{ LSB}$$

$$"2" \Rightarrow (1 + \varepsilon_2) \text{ LSB}$$



↳ Uneven codes
⇒ widths of all the codes are
not the same (1 LSB)

DNL ⇒ Deviation of a code width from ideal LSB.

k codes $(0 \text{ to } 2^N - 1)$

$$DNL(k) = \frac{\text{Width of code "k" - 1 LSB}}{1 \text{ LSB}} \quad \leftarrow \text{normalized}$$

↑

$$|DNL(k)| \leq 0.5 \text{ LSB}$$