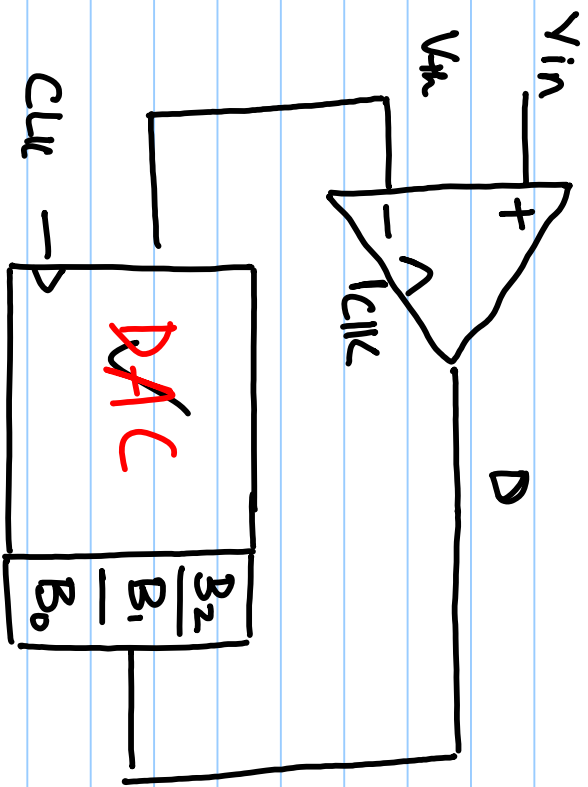


Lecture # 38

$2^N - 1$ Comparators \rightarrow N Comparators



SAR ADL: Successive Approximation Register.

Step 1. $V_{in} - V_{th} > 0$, $V_{th} = \frac{V_{ref}}{2}$

$\Rightarrow D = 1 \Rightarrow B_2 = 1$

$\Rightarrow V_{th} = \frac{3V_{ref}}{4}$

Step 2 $V_{in} - \frac{3V_{ref}}{4} > 0$

$\Rightarrow D = 0 \Rightarrow B_1 = 0$

$V_{th} = \frac{5V_{ref}}{8}$

Register.

Ex: $V_{th} = 0.7V$

$V_{ref} = 1V$

1. $B_2 = 1, B_1 = 0, B_0 = 0 \Rightarrow V_{th} = \frac{V_{ref}}{2} = 0.5$

$0.7 > 0.5 \Rightarrow D = 1 \Rightarrow B_2 = 1$

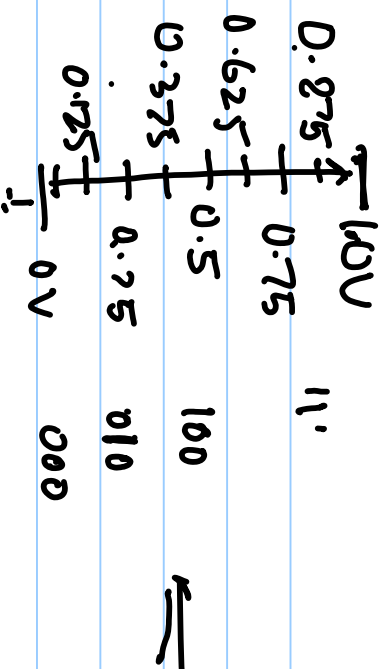
2. $B_2 = 1, B_1 = 1, B_0 = 0 \Rightarrow V_{th} = 0.75$

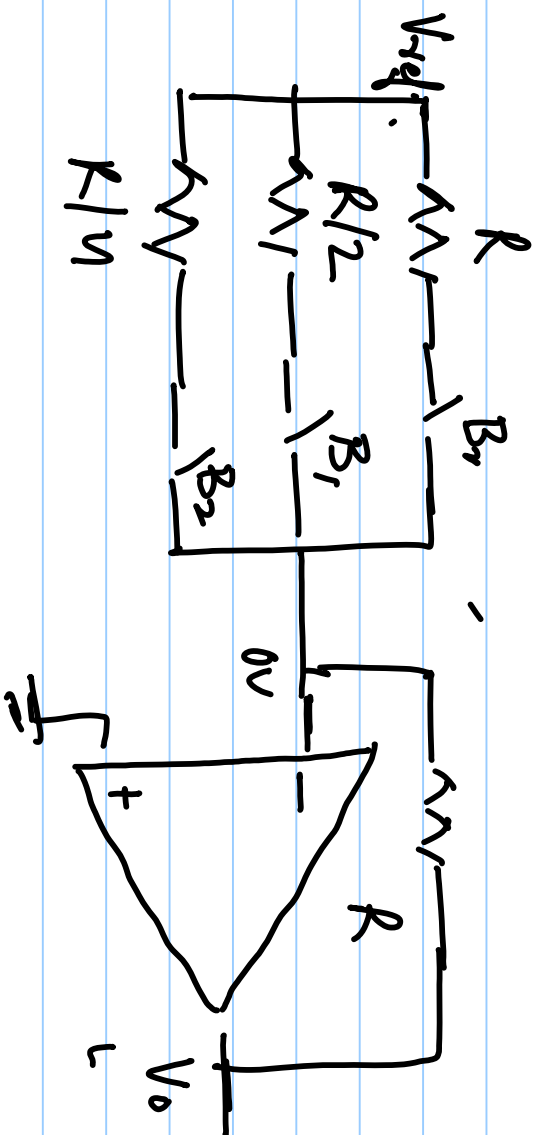
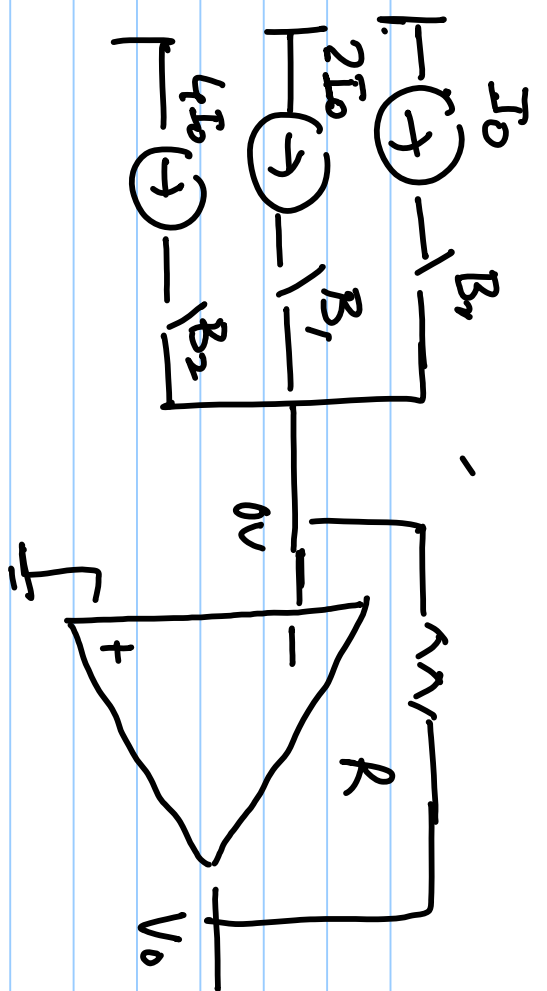
$0.7 < 0.75 \Rightarrow D = 0 \Rightarrow B_1 = 0$

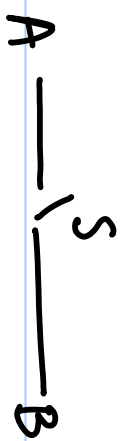
3. $B_2 = 1, B_1 = 0, B_0 = 1 \Rightarrow V_{th} = 0.625$

$0.7 > 0.625 \Rightarrow D = 1 \Rightarrow B_0 = 1$

$B_2 B_1 B_0$
 $1 0 1$







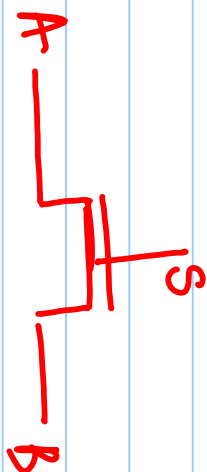
if $S = 1$



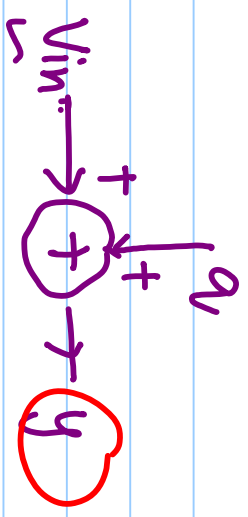
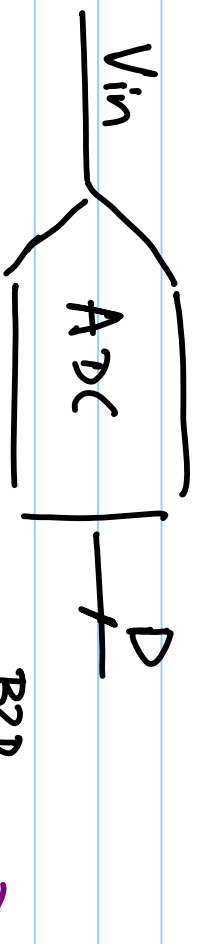
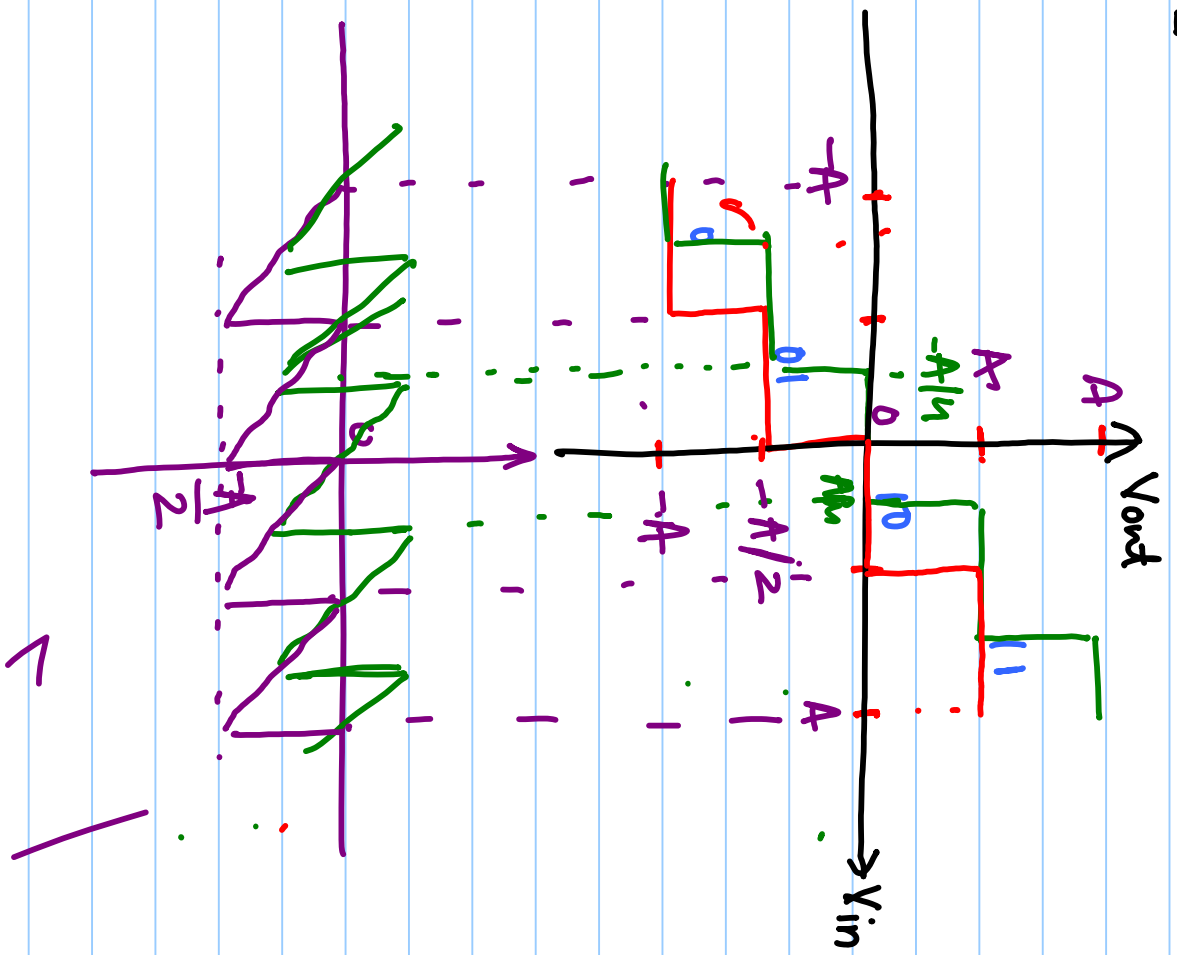
$S = 0$

A •

• B

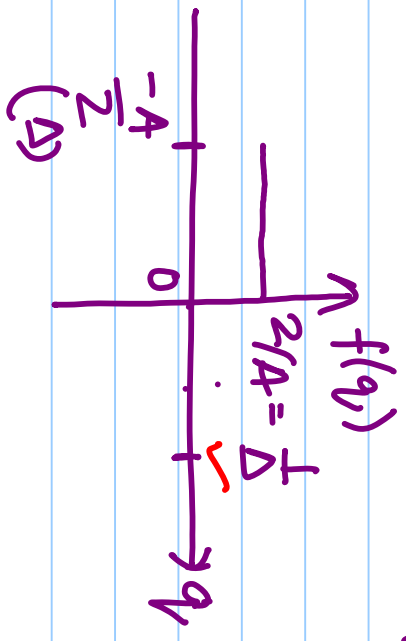


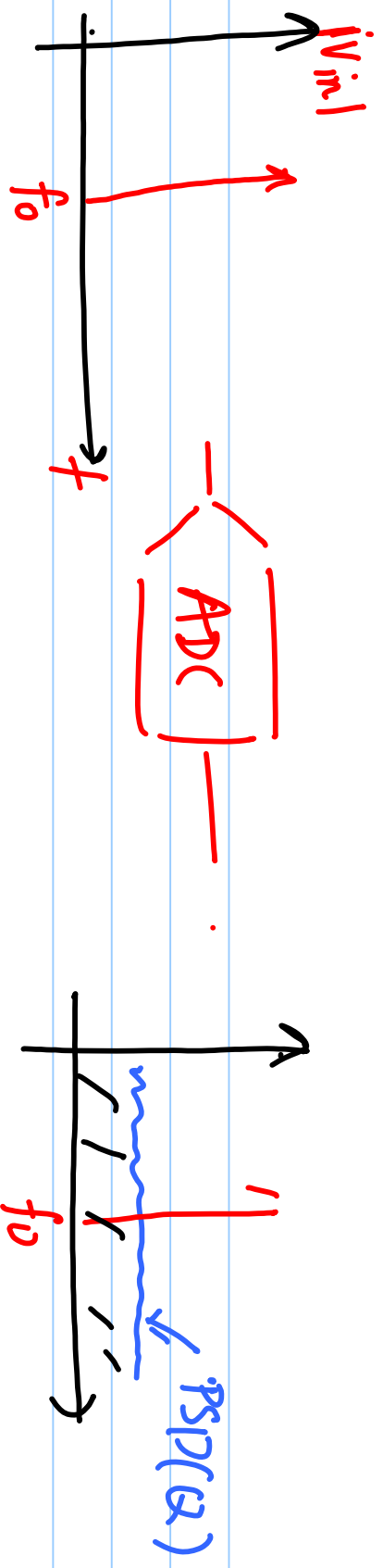
4. Quantization Error



$$y = V_{in} + e_q$$

$$e_q = y - V_{in} \quad (\text{Quantization Error})$$





Signal to Noise Ratio (SNR)

$$SNR = 10 \cdot \log_{10} \left(\frac{\text{Signal Power}}{\text{Noise Power}} \right) \quad \text{[dB]}$$