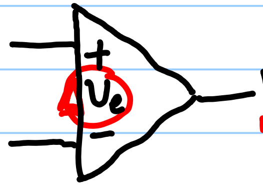
Note Title 02-02-2022

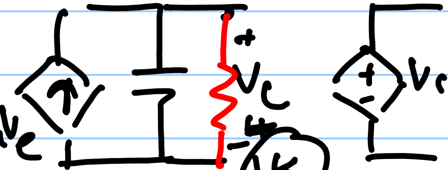
Lecture # 8



$V_o = A_0 V_e$

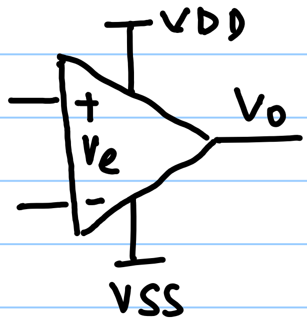
$$\frac{V_o}{V_e} = \frac{A_0}{1 + s/\omega_p}, \quad A_0 = 1000$$

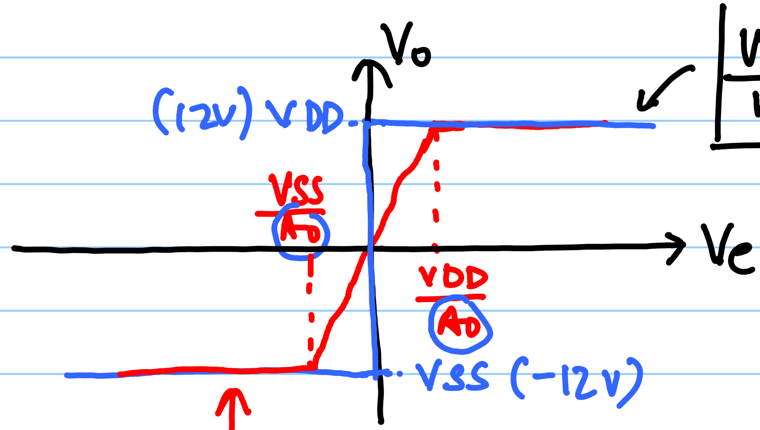
Ideal Amp. $\frac{V_o}{V_e} = \frac{G_m}{sC}$



$V_o = G_m (R_o \| \frac{1}{sC})$

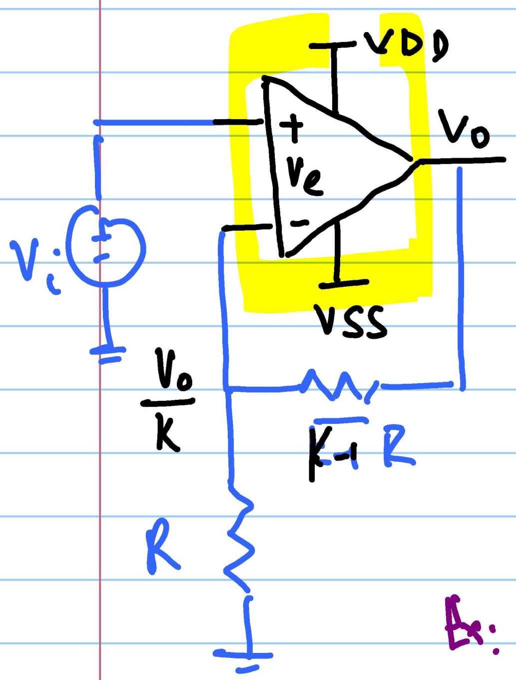
$= \frac{G_m R_o}{1 + sC R_o}$

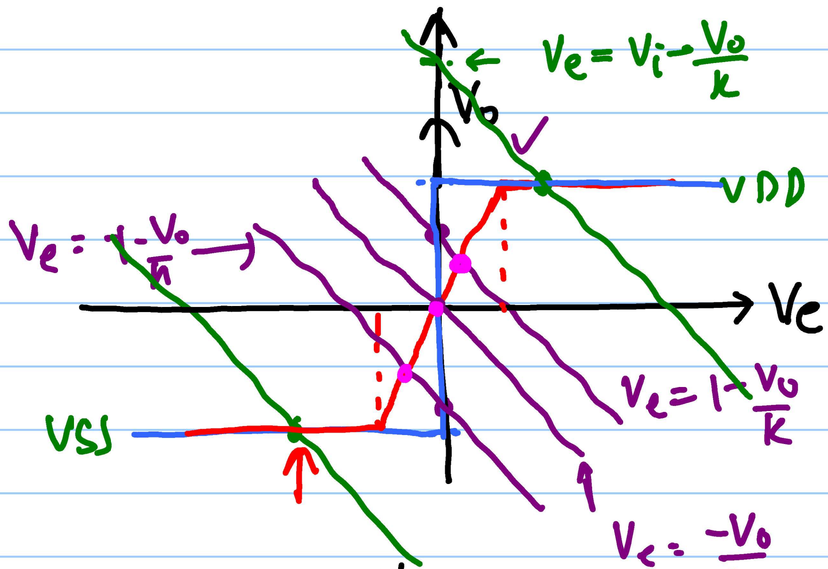




$$\frac{V_o}{V_e} = \frac{G_m}{sC}$$

$$\frac{V_o}{V_o} = \frac{A_0}{1 + s/\omega_p}$$





$$V_e = V_i - \frac{V_o}{K}$$

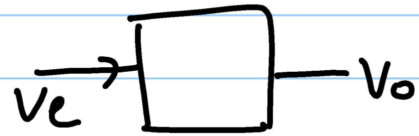
Ex:

$V_i = 1V \Rightarrow V_e = 1 - \frac{V_o}{K}$ ✓

$V_i = -1V \Rightarrow V_e = -1 - \frac{V_o}{K}$

$V_i = 0 \Rightarrow V_e = -\frac{V_o}{K}$

$$\frac{V_o}{V_e} = \frac{A_o}{1+s/\omega_p}$$



$$\lim_{t\to\infty} v_o(t) = \lim_{s\to 0} s \cdot V_o(s)$$

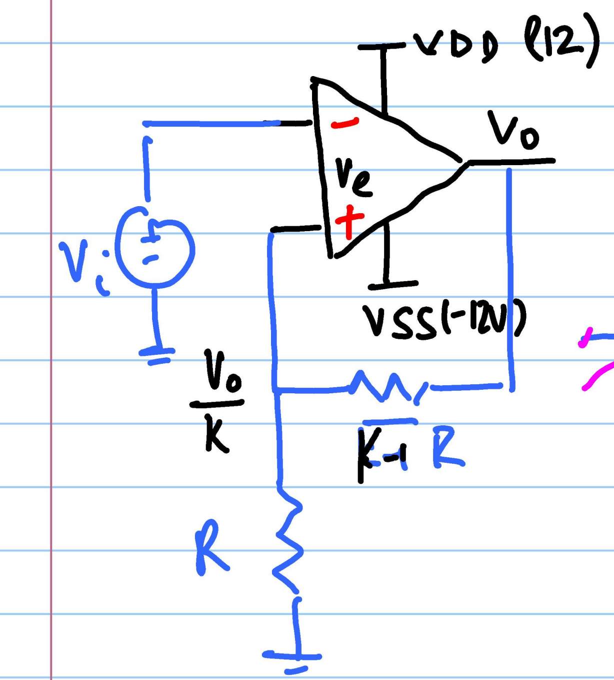
$$= \lim_{s\to 0} s \cdot \frac{A_o}{1+s/\omega_p} \{V_e(s)\}$$

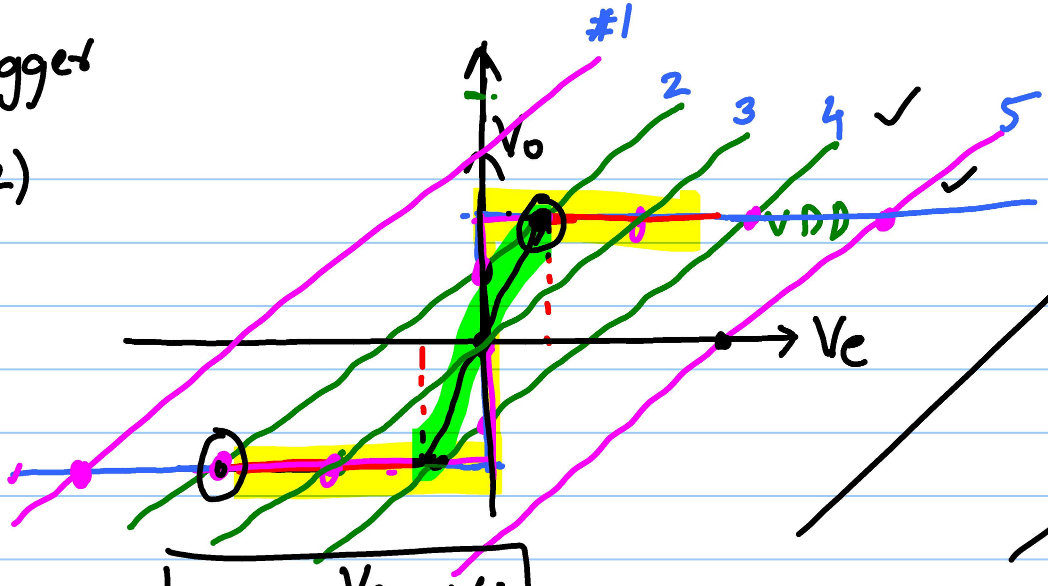
$V_e u(t) \xrightarrow{\mathcal{L}} \frac{V_e}{s}$

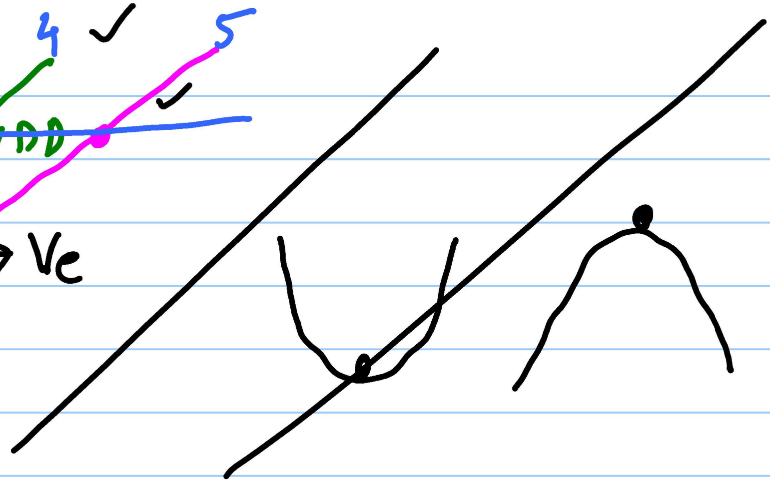
$$= \lim_{s\to 0} s \cdot \frac{A_o}{1+s/\omega_p} \cdot \frac{V_e}{s}$$

$$= A_o V_e$$

Inverting "Schmitt" Trigger







$$V_e = \frac{V_o}{K} - V_i$$

$V_i = 0$, $V_e = \frac{V_o}{K}$

$V_i = 1V$, $V_e = \frac{V_o}{K} - 1$

- large -ve i/p V_i, $V_o = VDD$

  $V_e = \frac{12}{K} - V_i$

- $V_i = 0$, $V_e > 0$

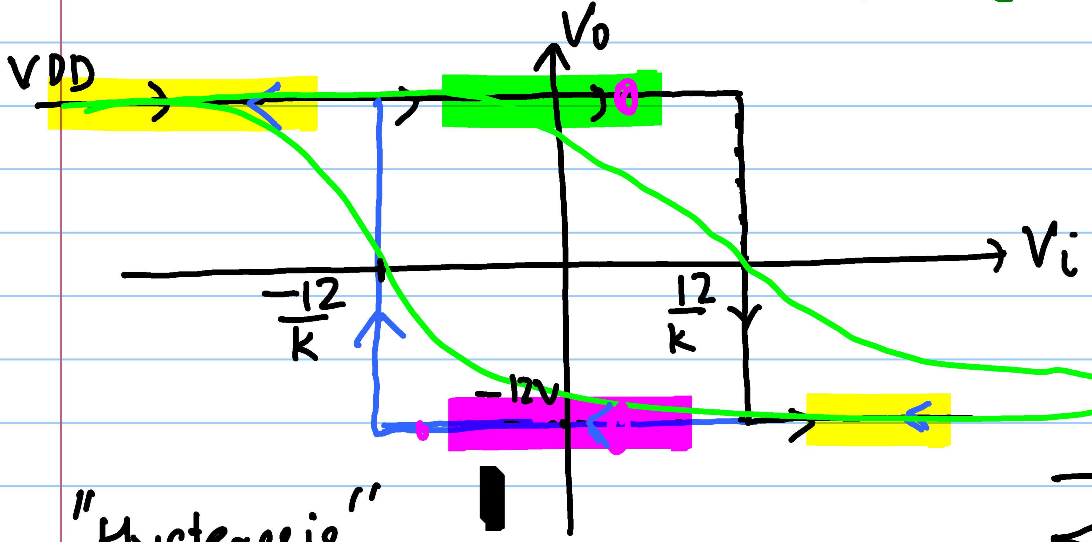
- $V_e = \frac{12}{K} - V_i < 0$

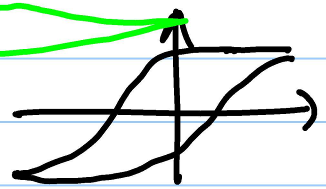
  $V_i > \frac{12}{K}$

- large +ve i/p V_i

  $V_e = \frac{-12}{K} - V_i < 0$

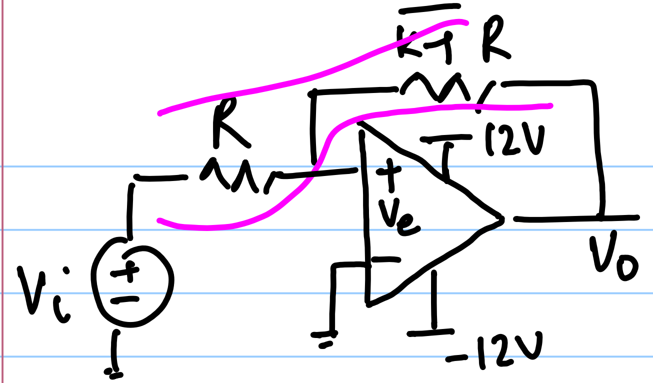
  $V_e = \frac{-12}{K} - V_i > 0 \Rightarrow V_i < \frac{-12}{K}$





"Hysteresis"

"Non-inverting" Schmitt Trigger.



$$V_e = \frac{1}{K} \cdot V_o + \frac{K-1}{K} V_i$$

$$V_e = \frac{12}{K} + \frac{K-1}{K} \cdot V_i < 0$$

$$V_i < -\frac{12}{K-1}$$