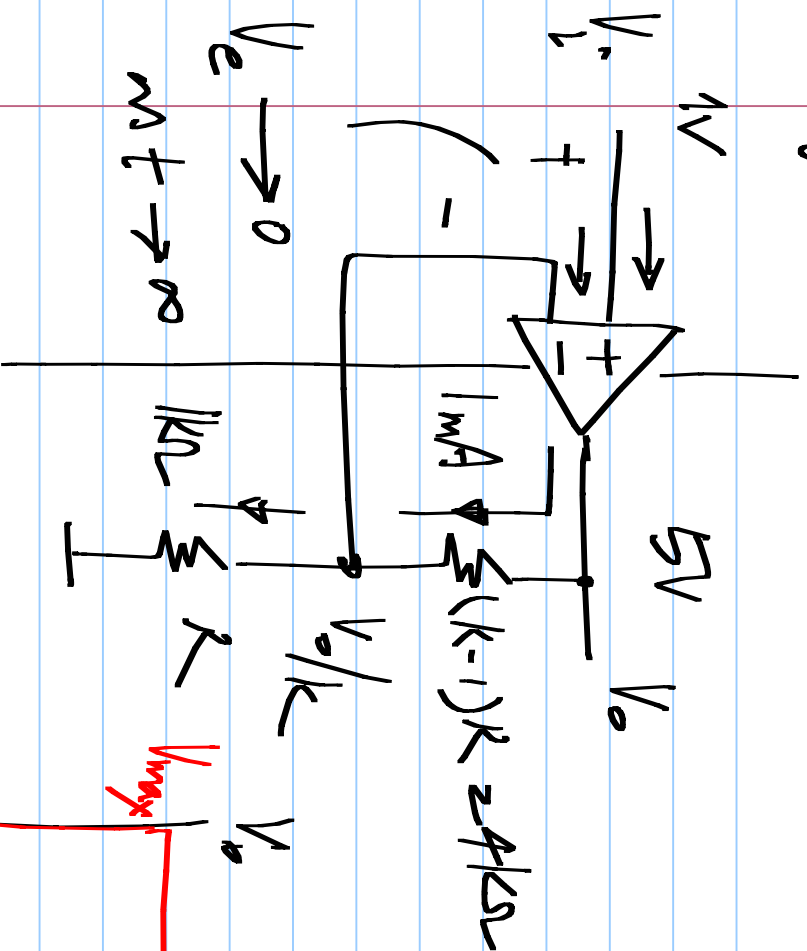
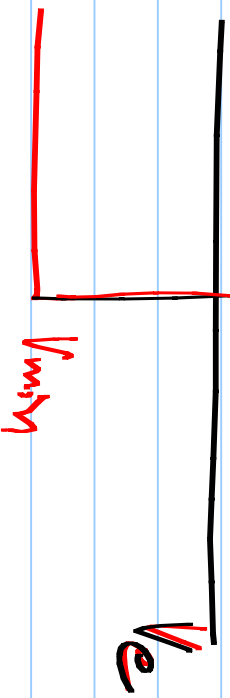
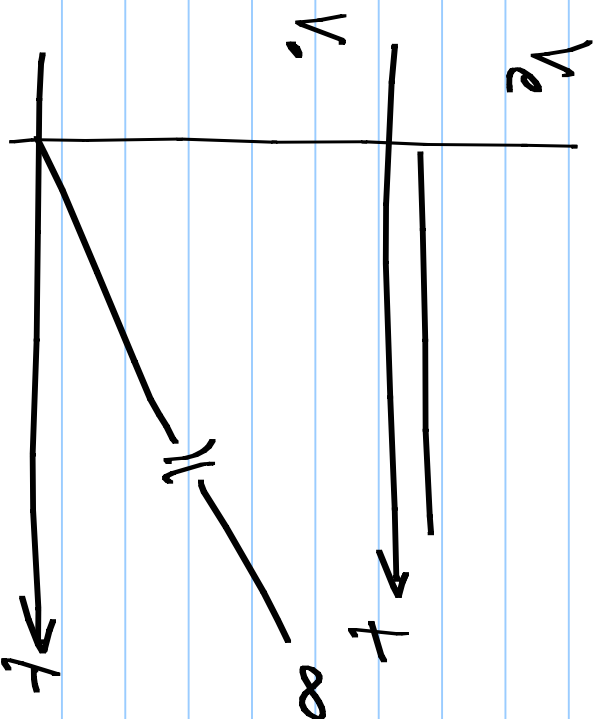
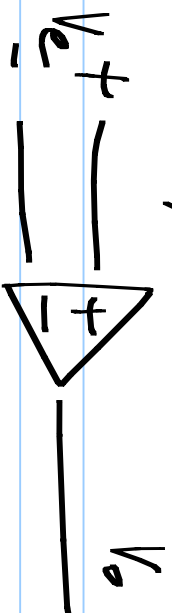
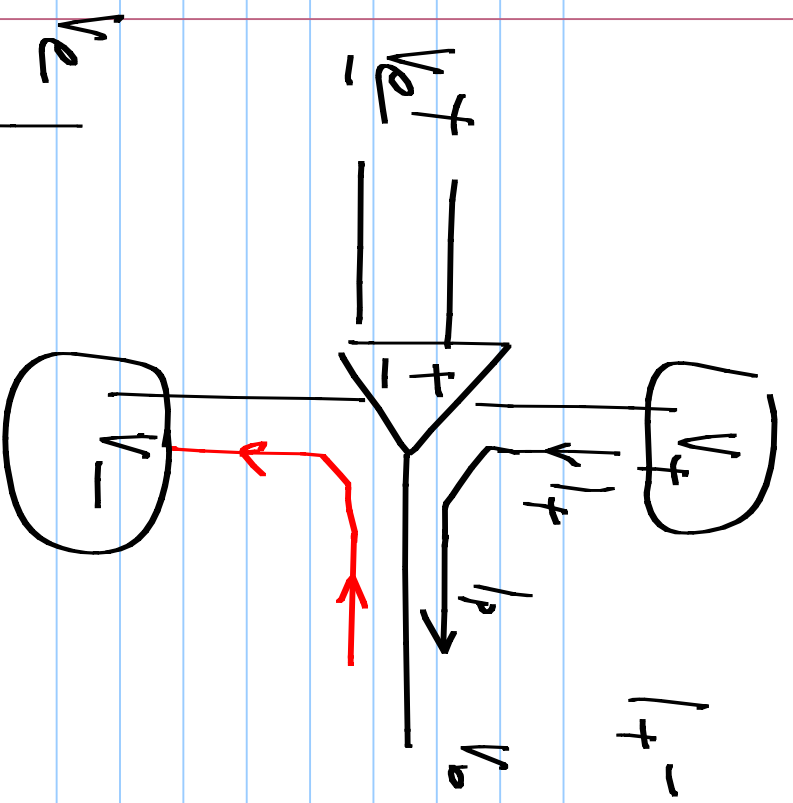


Negative feedback amplifier

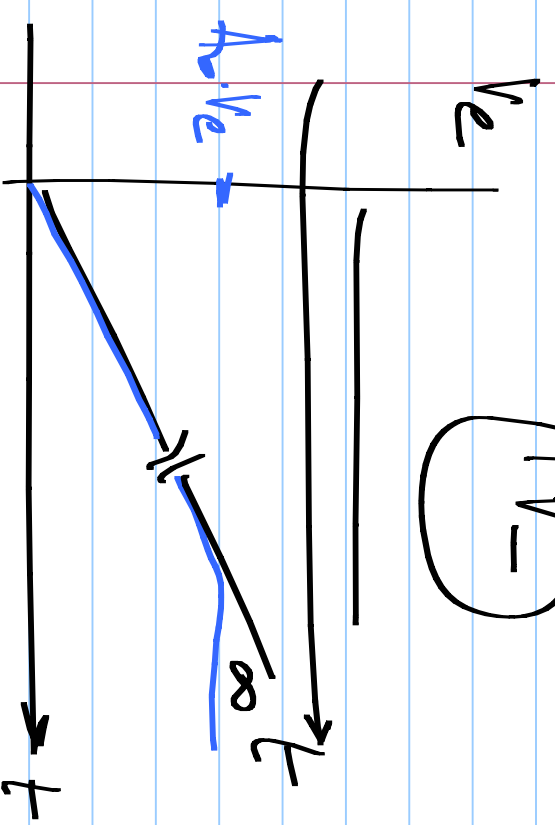
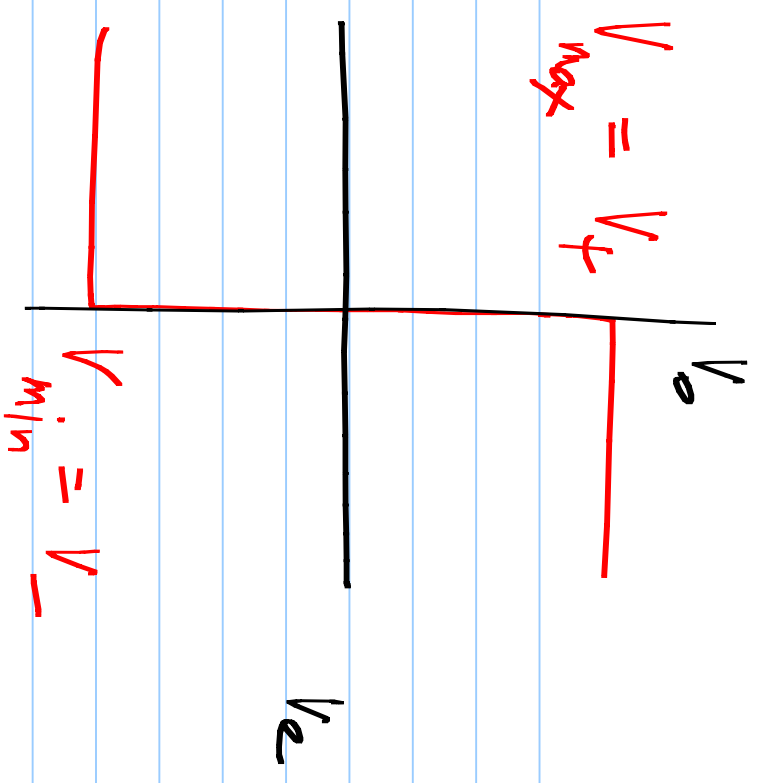


gain $\rightarrow \infty$ in (dc) steady state





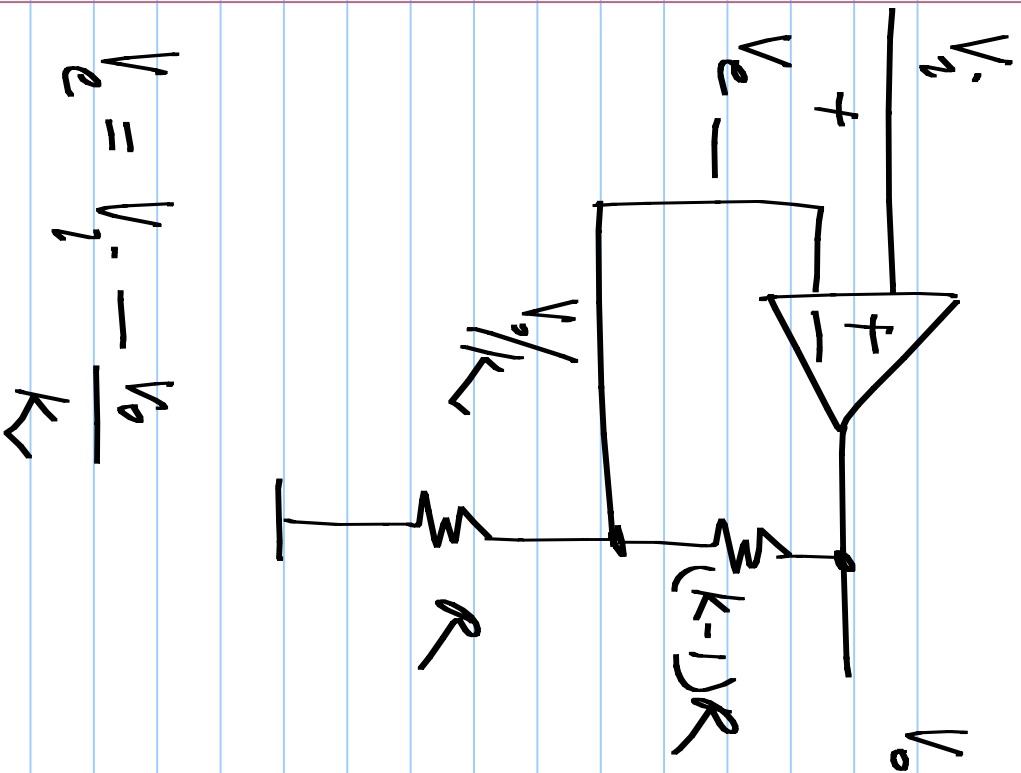
$$|+ -| -$$



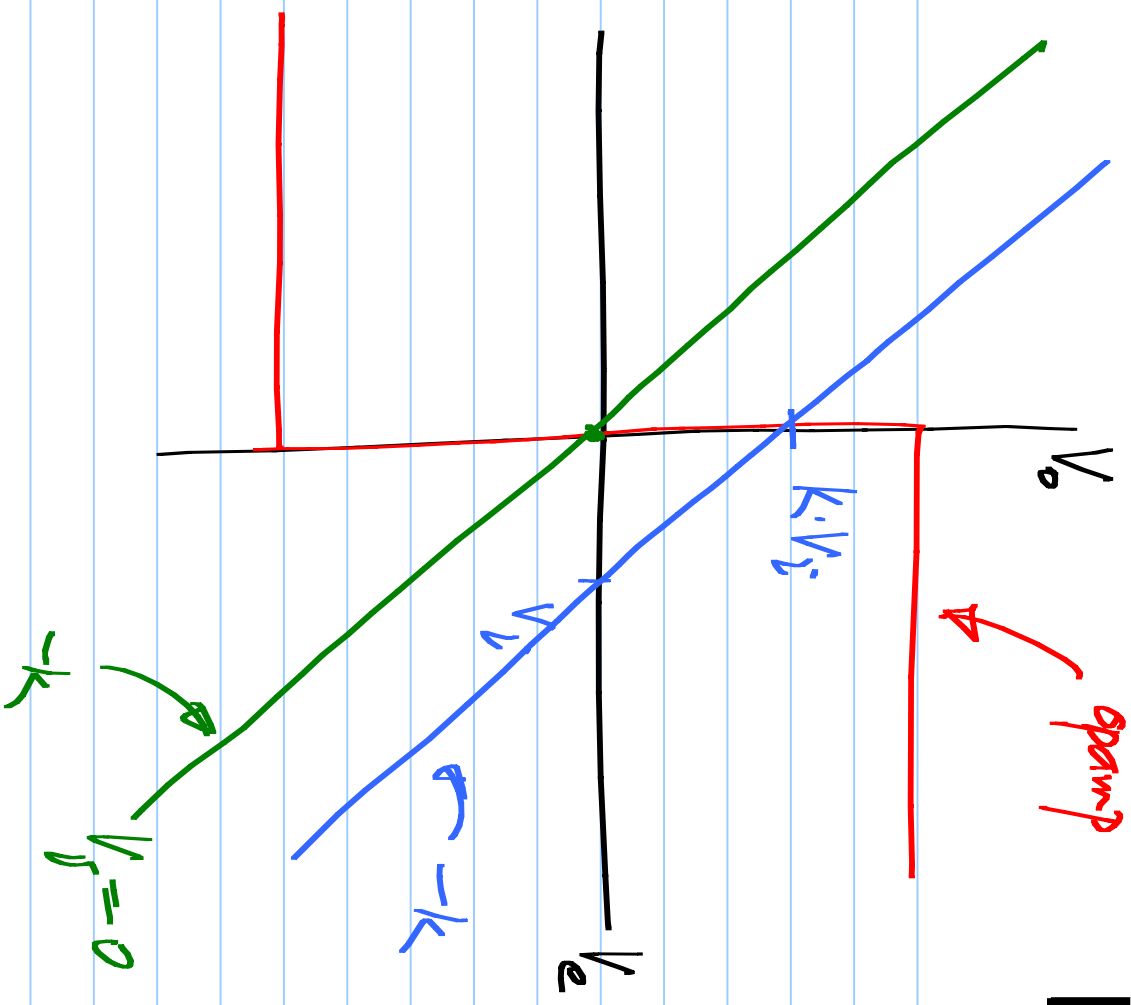
In steady state; (Ideal)

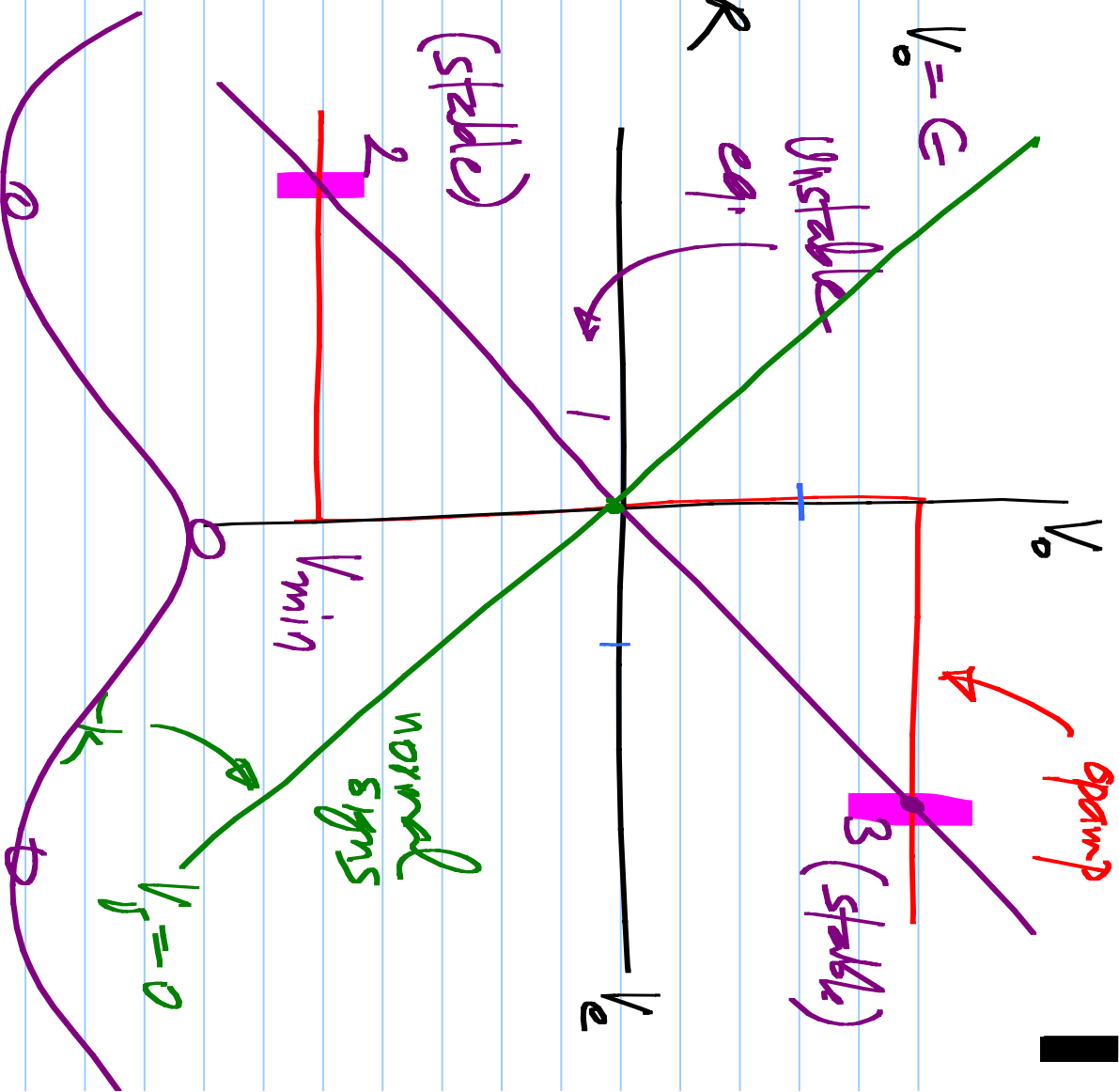
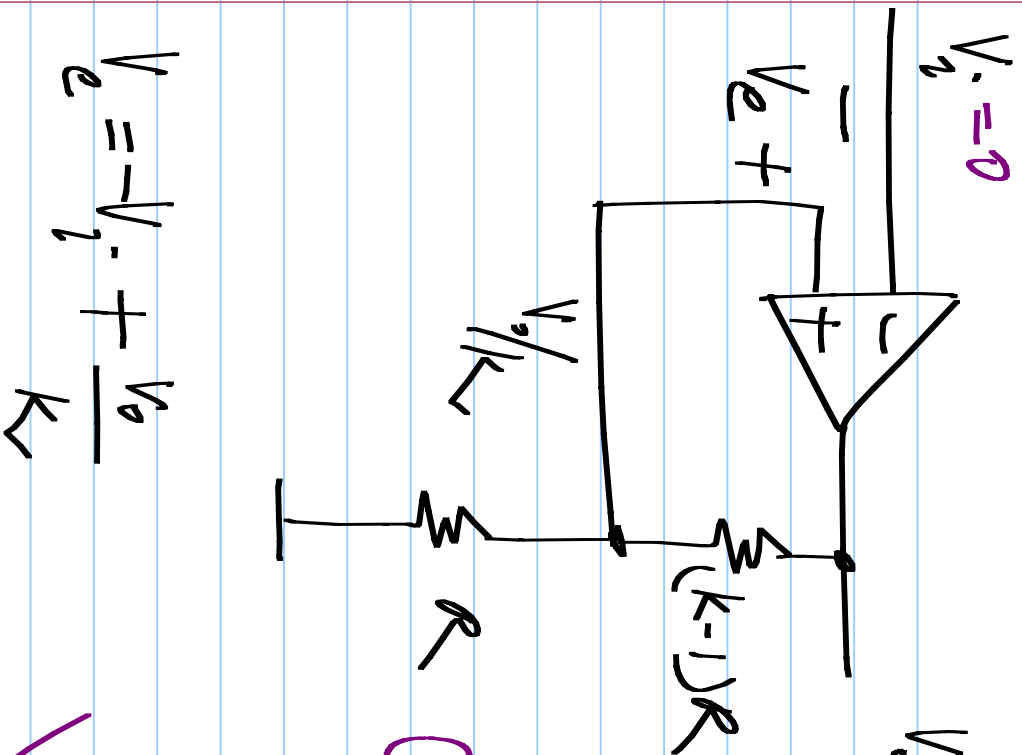
$$V_o = A_o \cdot V_e \quad A_o \rightarrow \infty$$

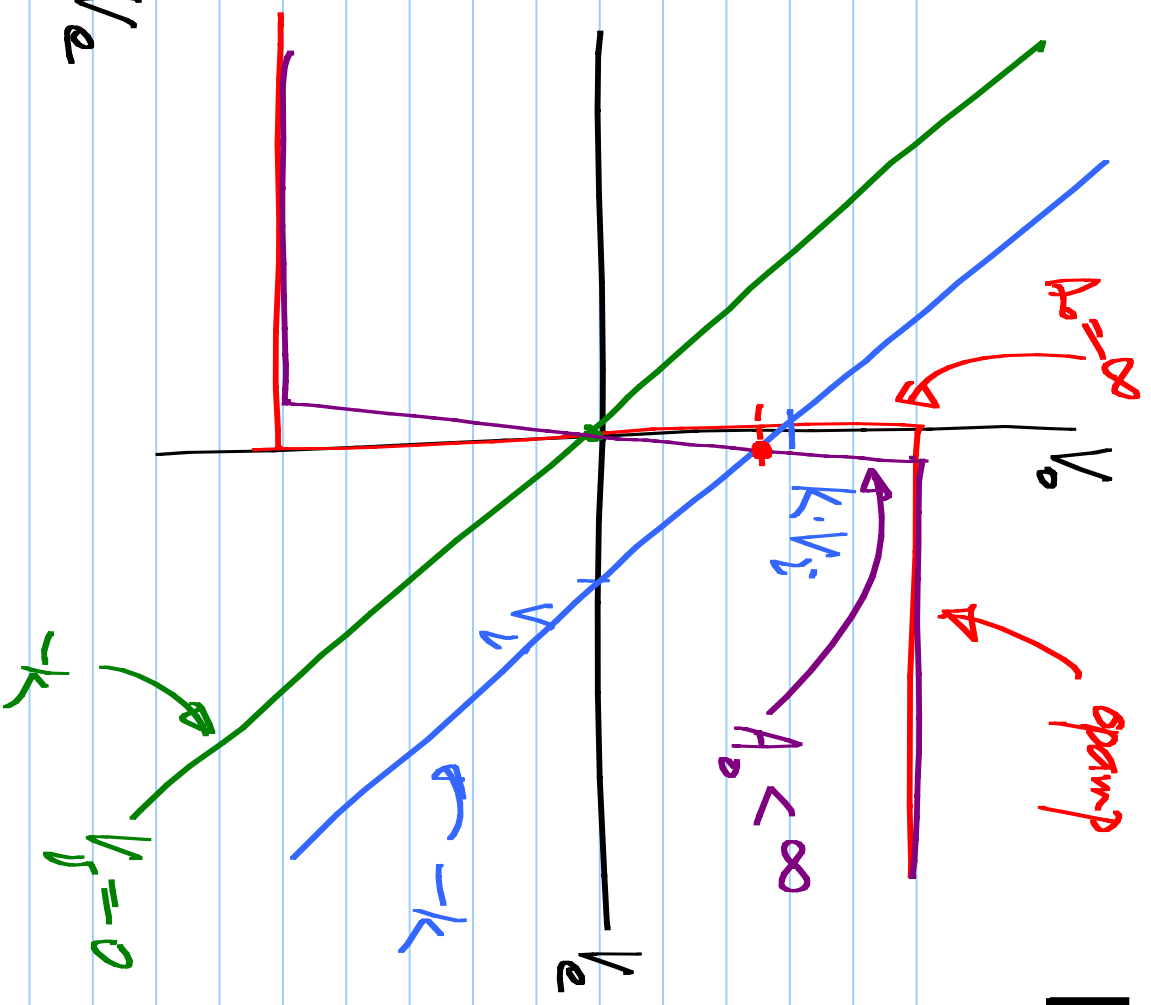
(If -ve feedback) $V_e \rightarrow 0$



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





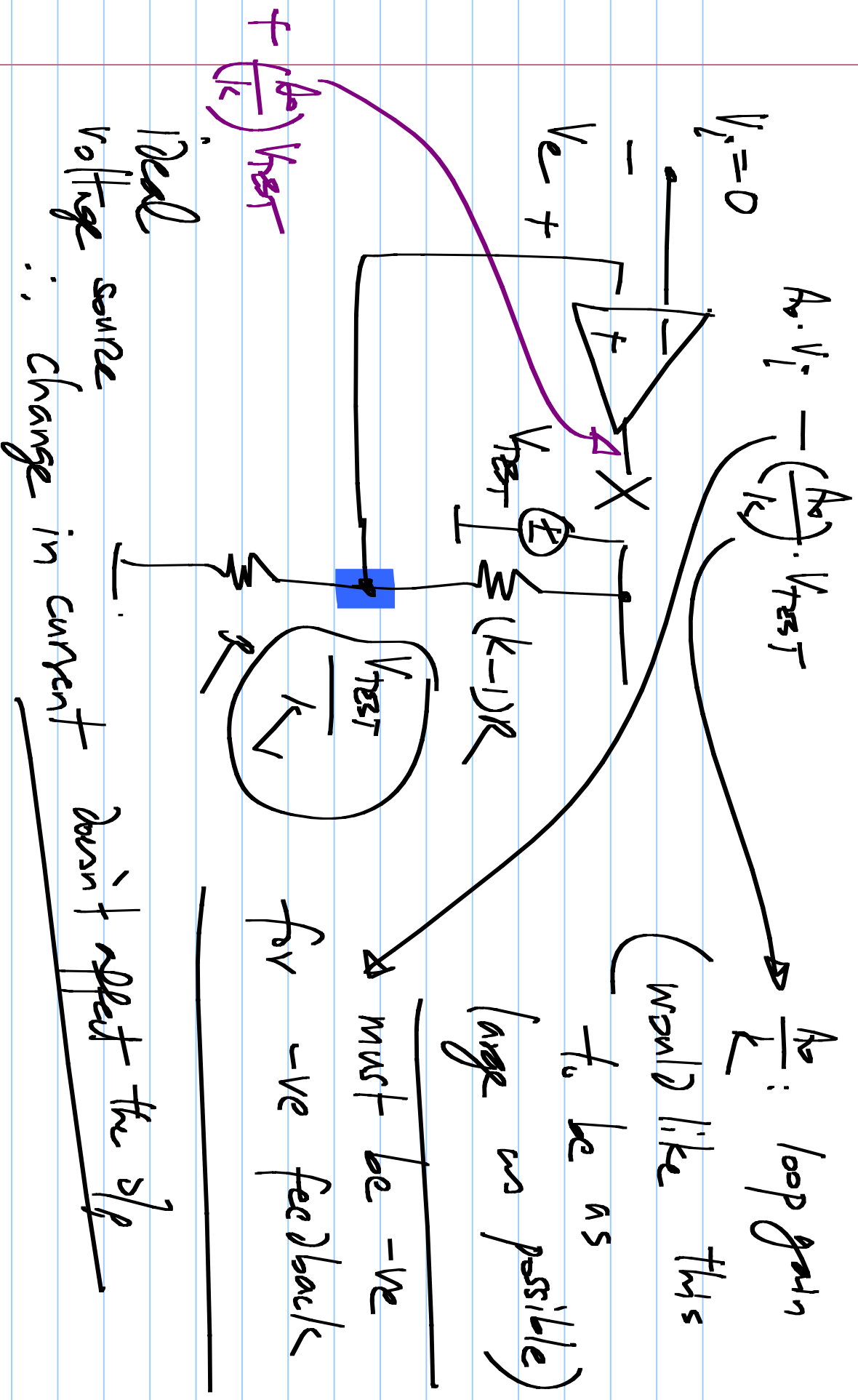


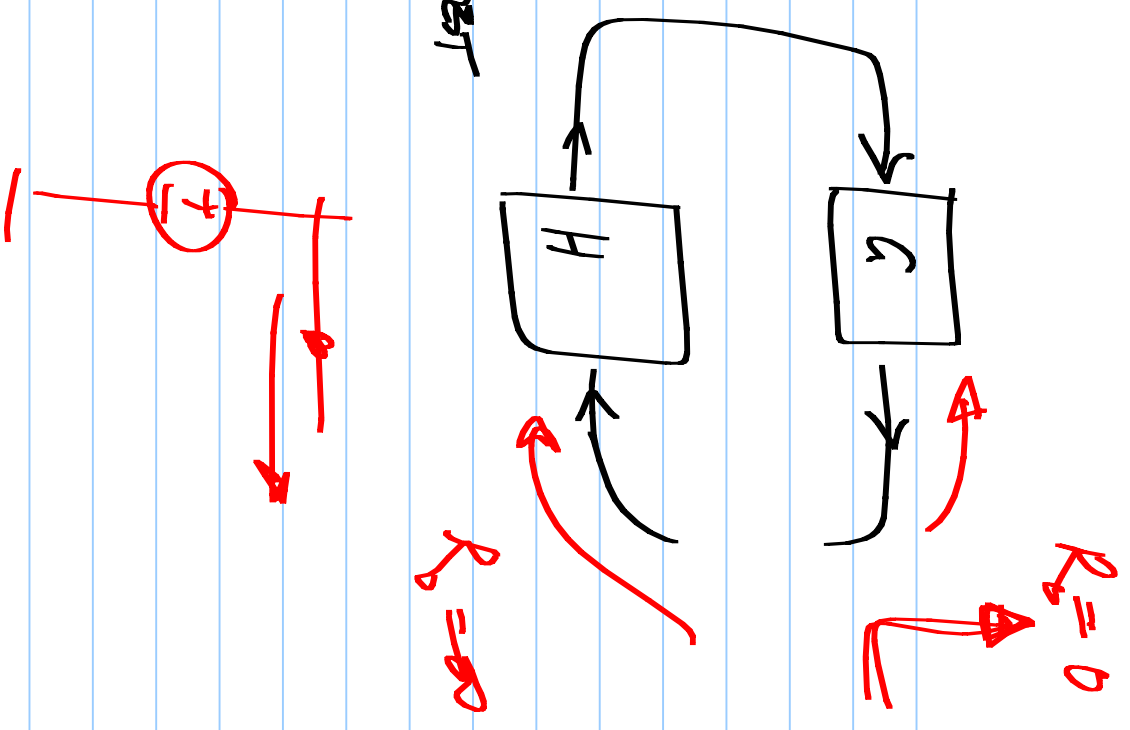
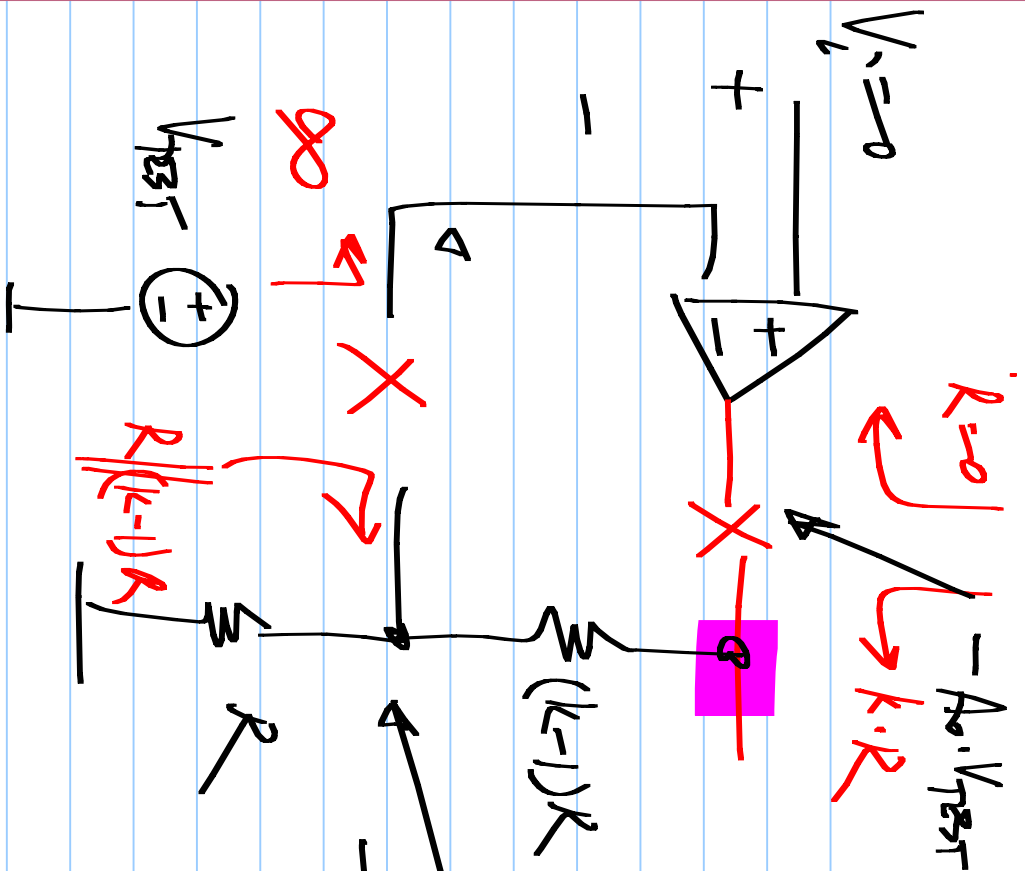
$$\frac{V_o}{V_i} = \frac{k}{1 + \frac{k}{A_o}} = \frac{k \cdot A_o}{k + A_o}$$

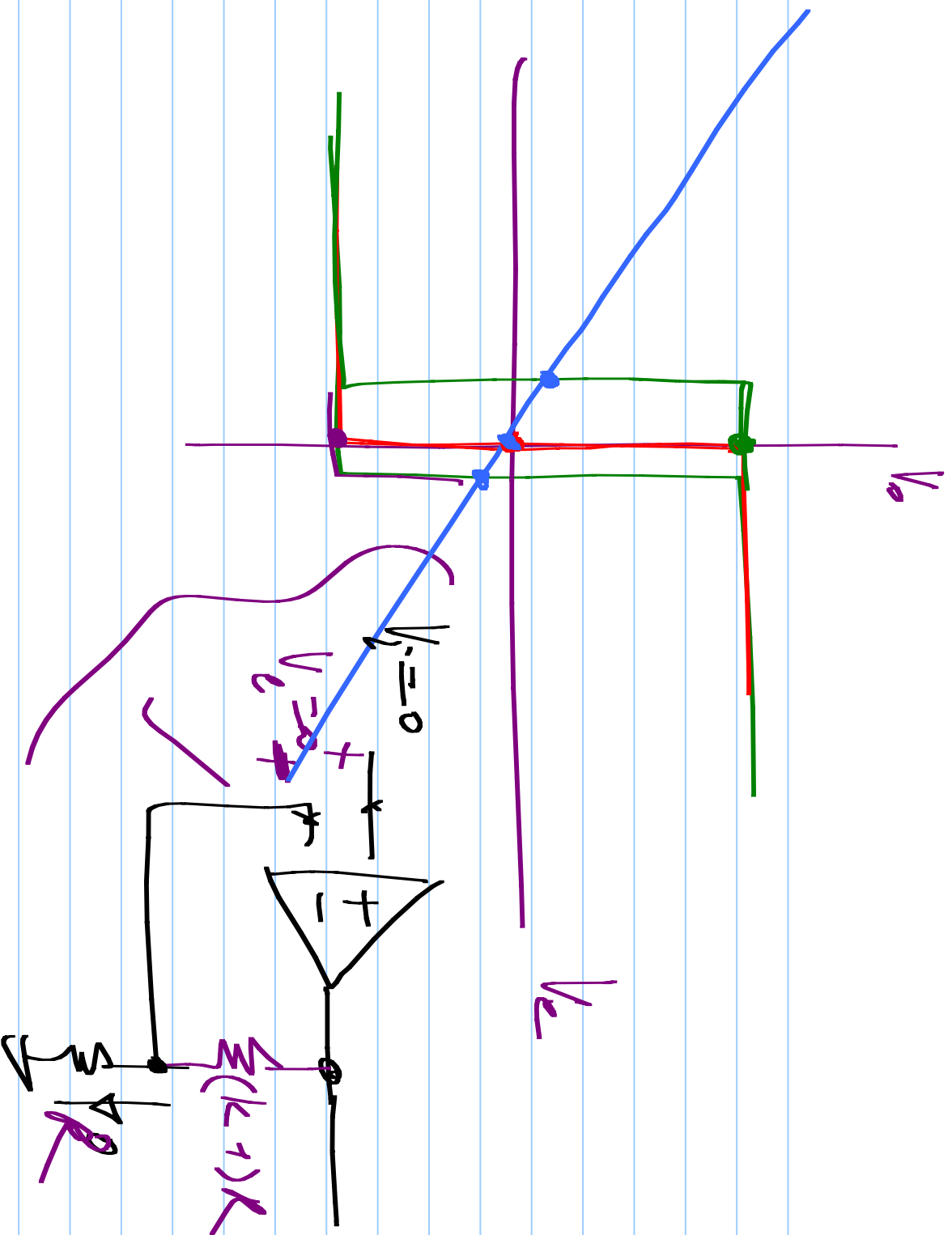
$\approx k$ if $\frac{A_o}{k}$ is very large

Relative error: $\underline{\underline{-\frac{1}{k \cdot A_o}}}$

1% gain accuracy: $\frac{A_o}{k} \gg 100; \quad k=10; \quad A_o > 1000$







$$V_o = k V_i$$

VCVS

$$R_i =$$

Controlled sources:

$$R_i$$

$$R_{out}$$

$$\checkmark V_{CVS} :$$

$$\infty$$

$$0$$

$$V_{CES} :$$

$$\infty$$

$$\infty$$

$$V_{CVS} :$$

$$0$$

$$0$$

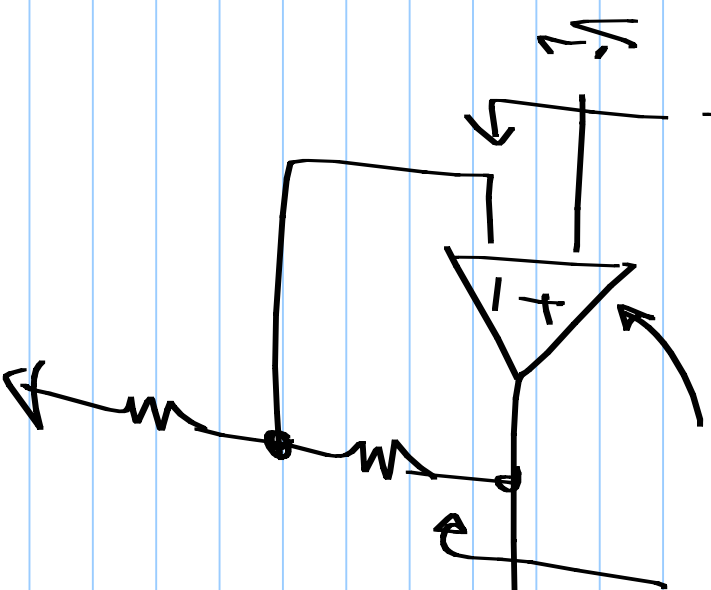
$$V_{CES} :$$

$$0$$

$$\infty$$

$$R_i$$

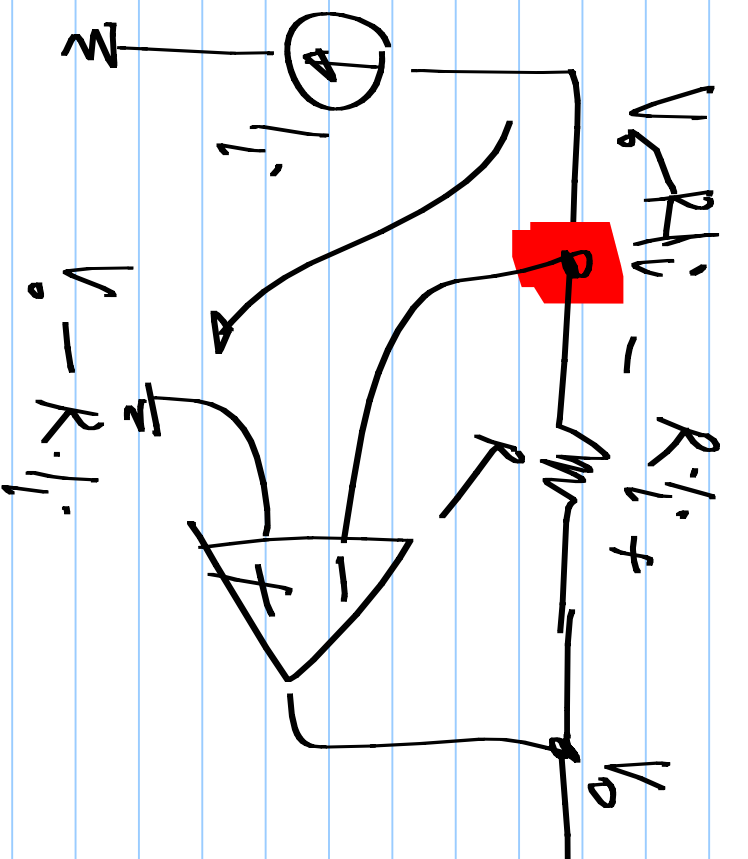
$$A_o = \infty$$



CCVS:

$$V_o = R \cdot I_i$$

$$(V_o - R \cdot I_i) = 0$$

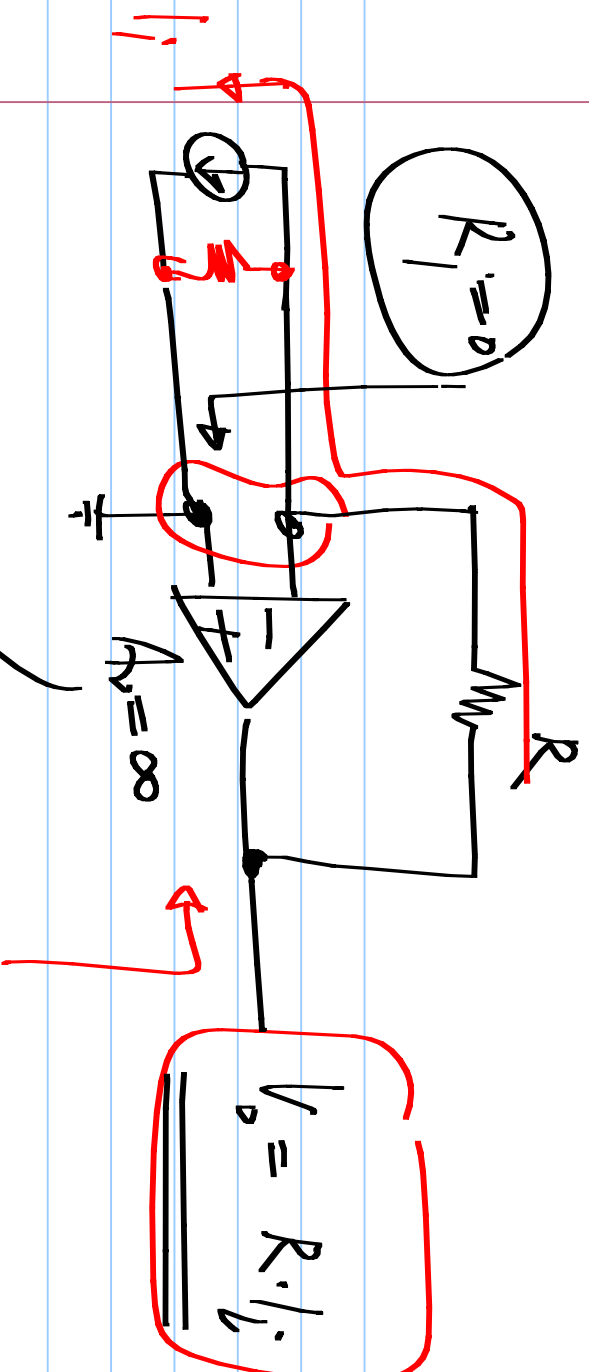


I_i $V_o - R \cdot I_i > 0$
decrease V_o

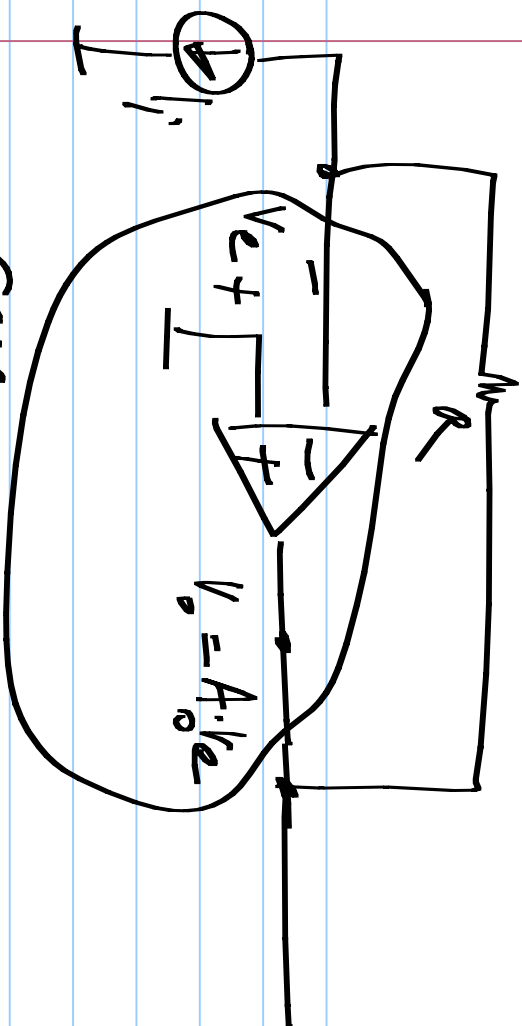
$$V_o - R \cdot I_i < 0$$

increase V_o

CCVS



Controller with ∞ gain
 $\underline{VCS} \quad V_e \rightarrow A_o V_e : A_o \rightarrow \infty$



CCVS

Evaluate

$V_o, R_i, R_{in}, R_{out}$

limit $g_o \rightarrow \infty$

①

