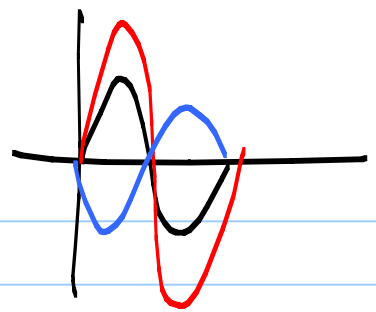
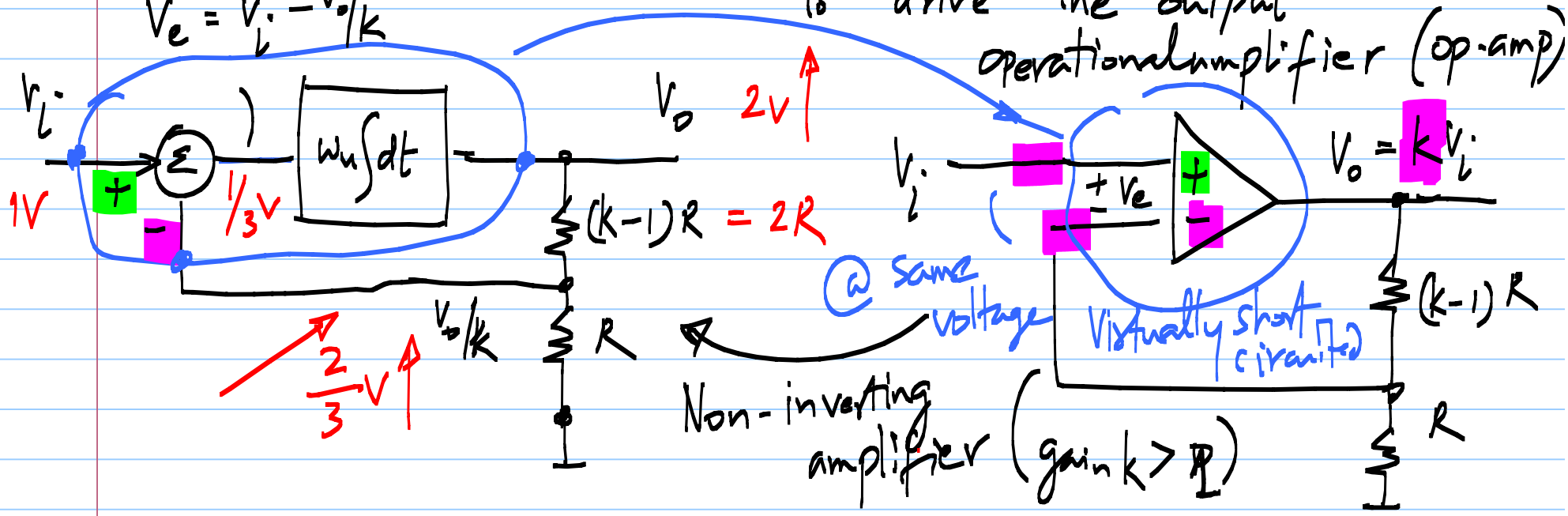
EC1010: Lecture 21

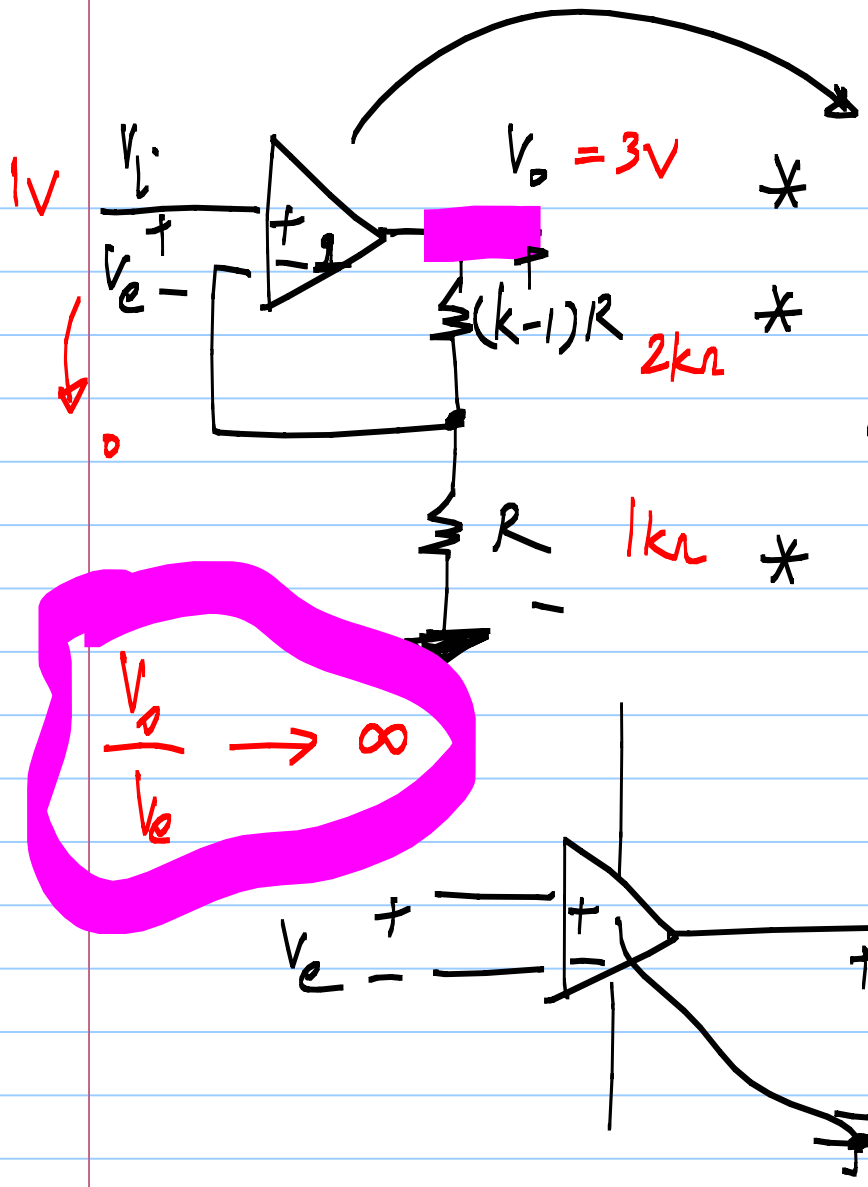


Negative feedback amplifier: $V_o = kV_i$

Compare $\frac{V_o}{k}$ to V_i ⟩ Integrate the error (difference) to drive the output

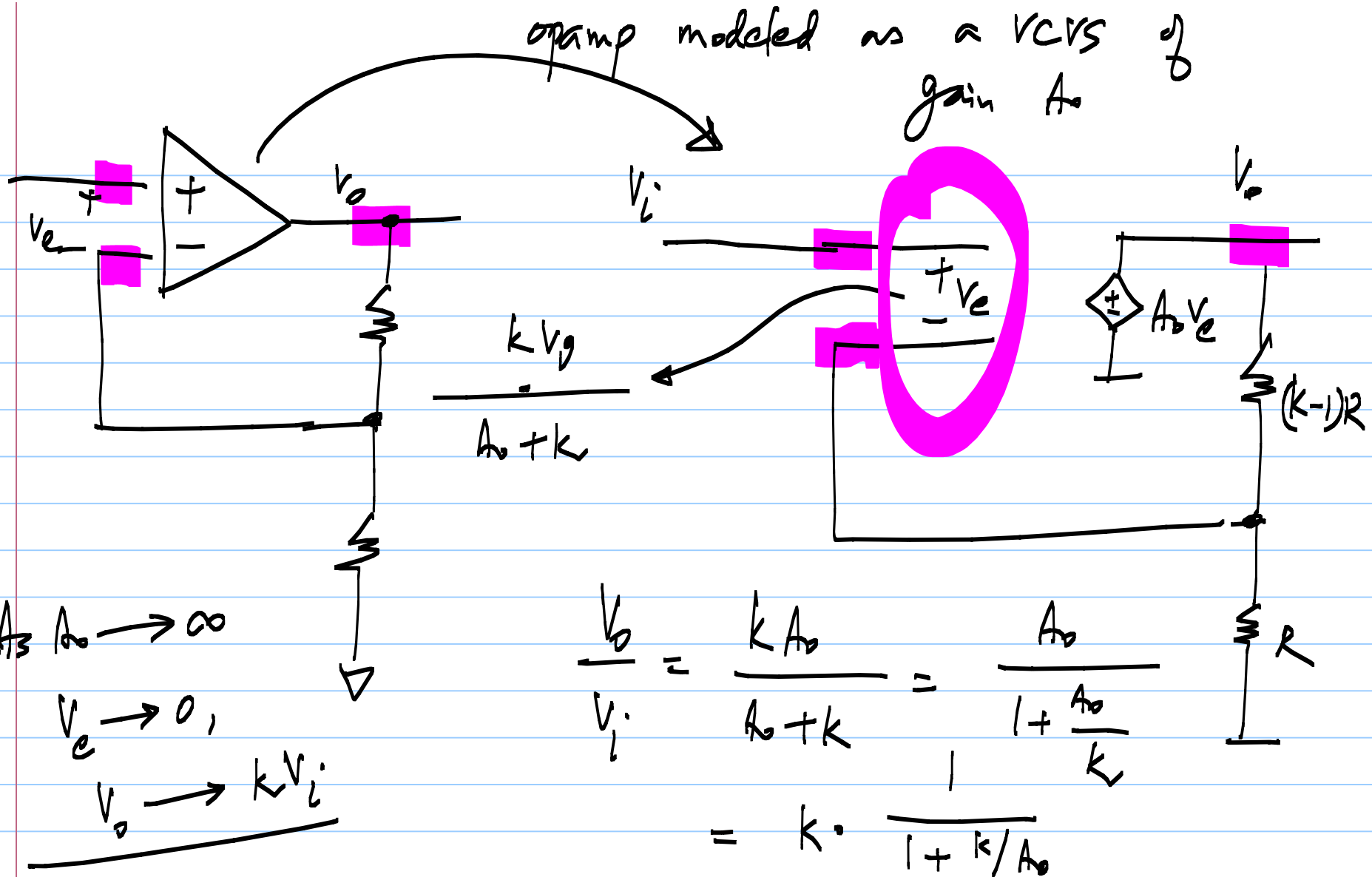
$V_e = V_i - V_o/k$





* op amp: "integrates" the error V_e
* If it is in negative feedback, eventually V_e reaches zero
* $V_e = 0 \Rightarrow$ opamp inputs are virtually shorted to each other

(Negative feedback essential for this!)



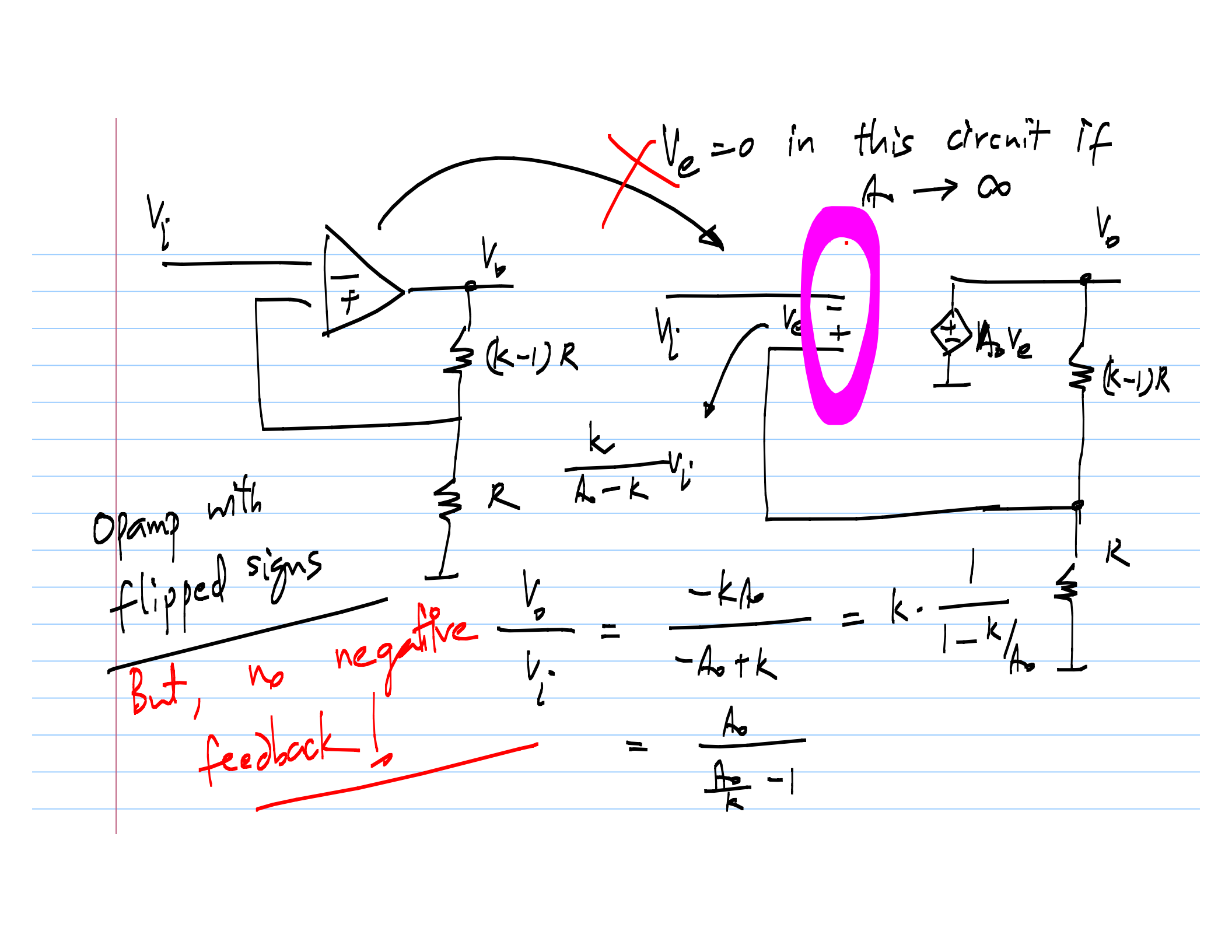
As $A_0 \to \infty$

$V_e \to 0$,

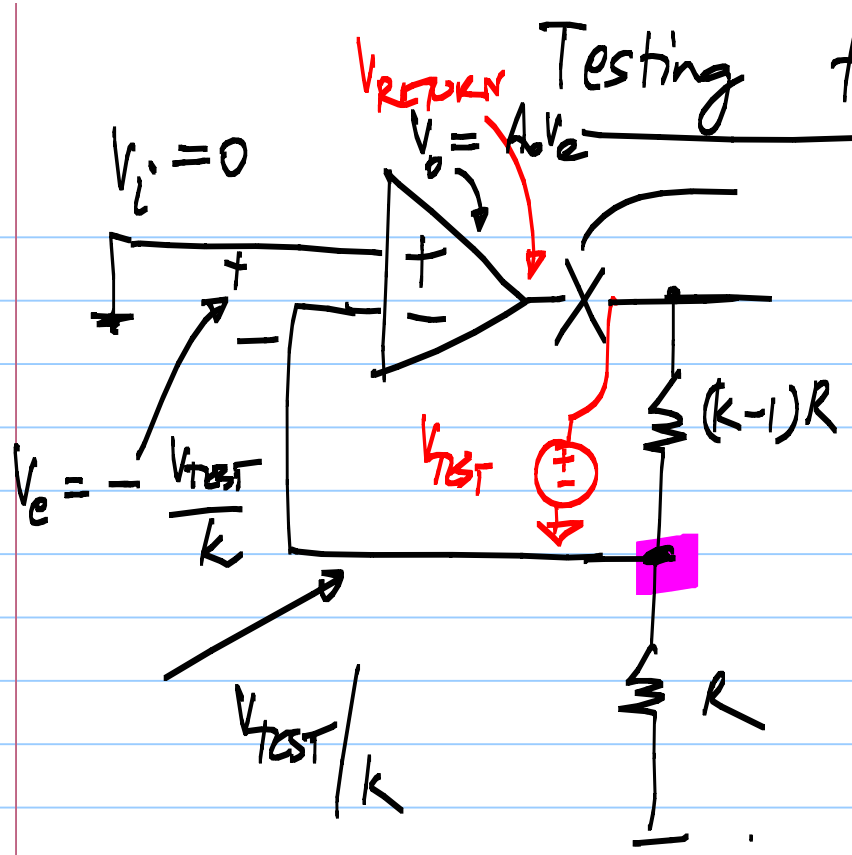
$V_o \to kV_i$

$$\frac{V_o}{V_i} = \frac{kA_0}{A_0+k} = \frac{A_0}{1+\frac{A_0}{k}}$$

$$= k \cdot \frac{1}{1+k/A_0}$$


$V_e = 0$ in this circuit if $A_o \to \infty$
V_i
V_b
$(k-1)R$
R
V_o
$A_o V_e$
$\frac{k}{A_o - k} V_i$
Opamp with flipped signs
But, no negative feedback!
$\frac{V_o}{V_i} = \frac{-kA_o}{-A_o + k} = k \cdot \frac{1}{1 - k/A_o}$
$= \frac{A_o}{\frac{A_o}{k} - 1}$

Testing for negative feedback



* Set inputs to the circuit to zero
* Break the loop at the output of the opamp

$$V_{RETURN} = -\frac{A_o}{k} V_{TEST}$$