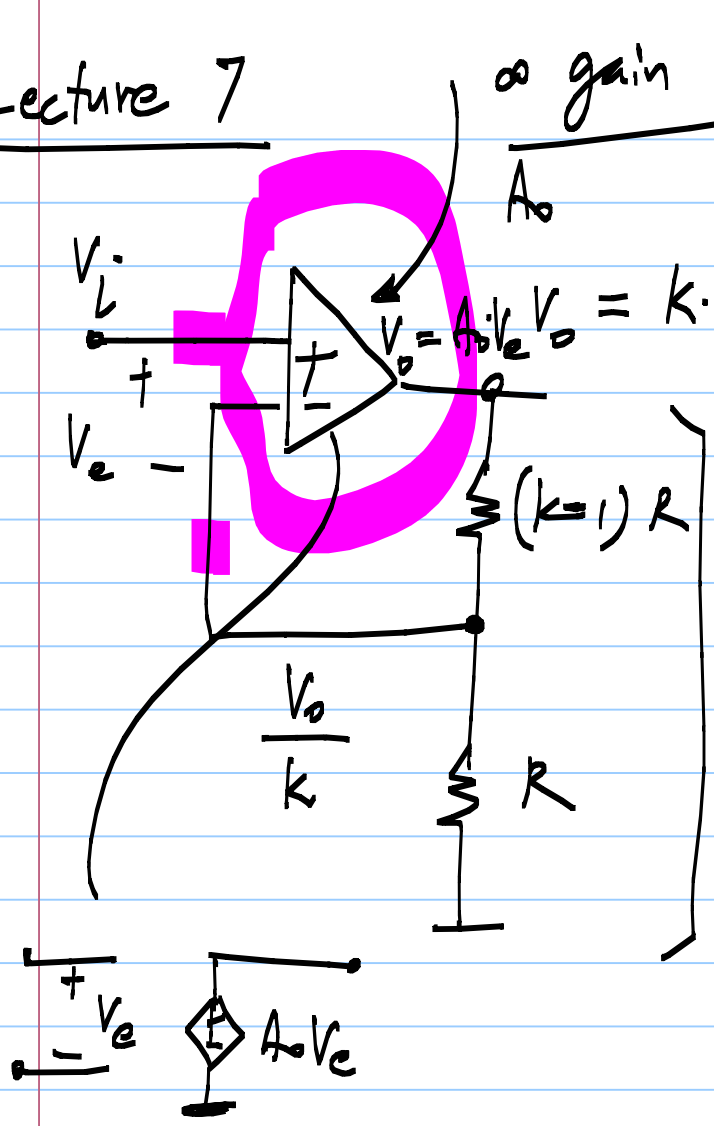
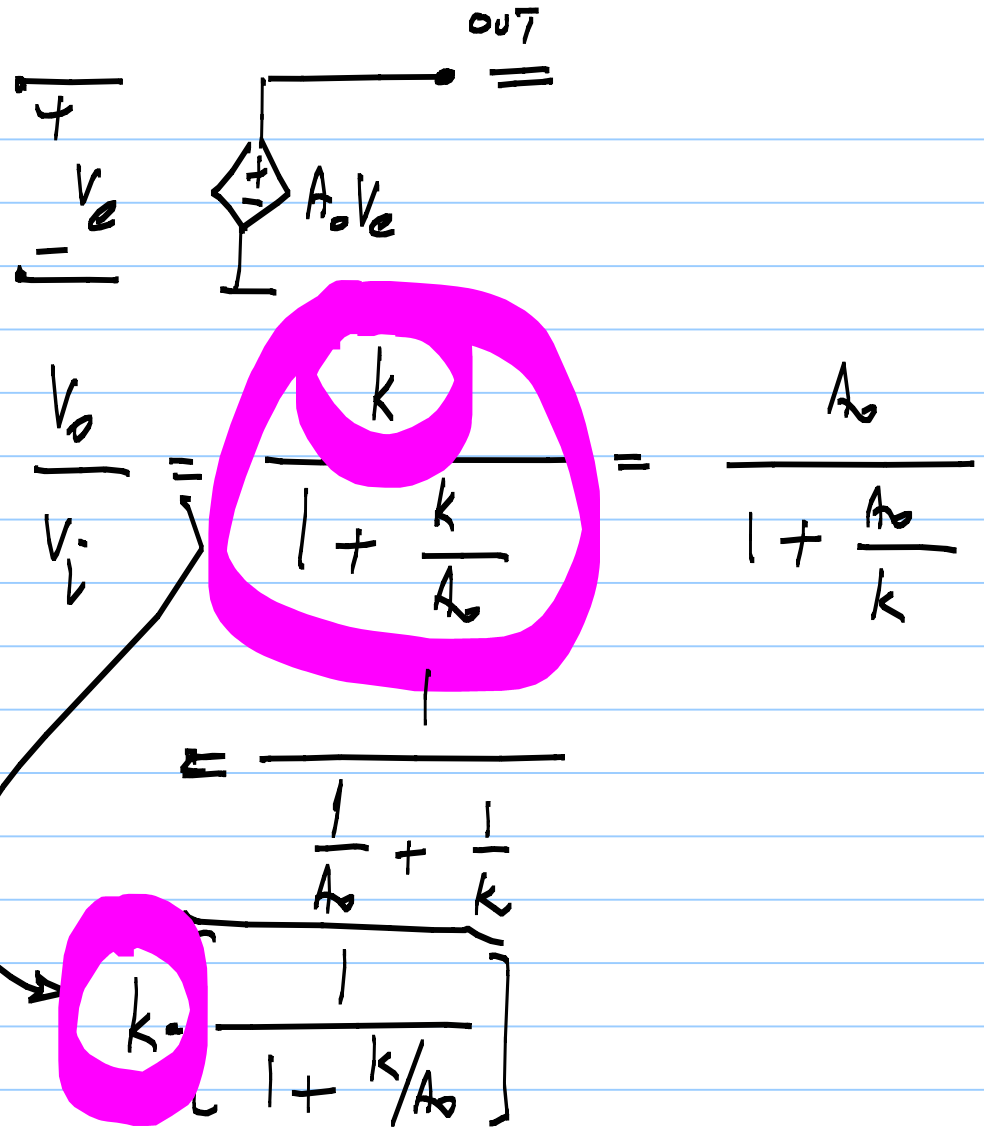
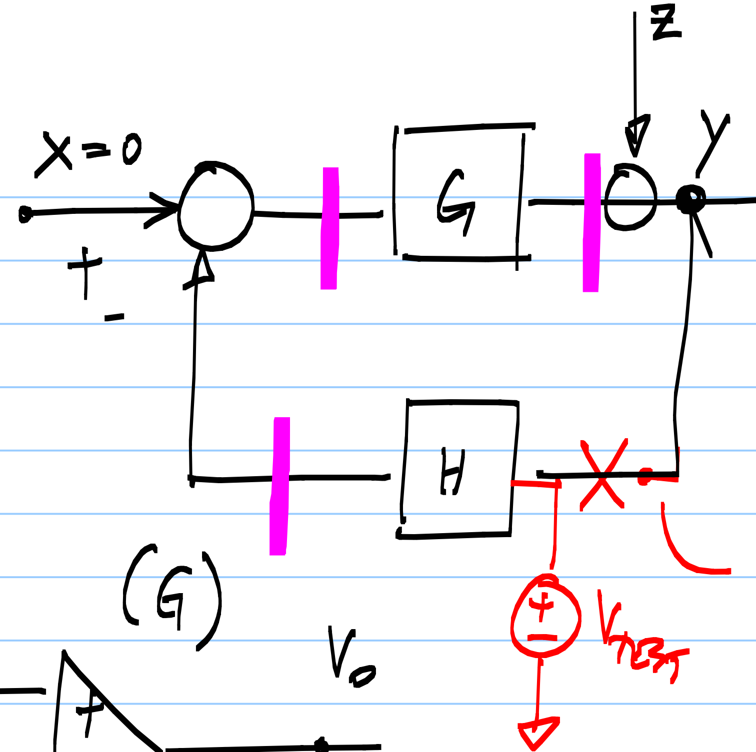
Lecture 7

∞ gain

A_0



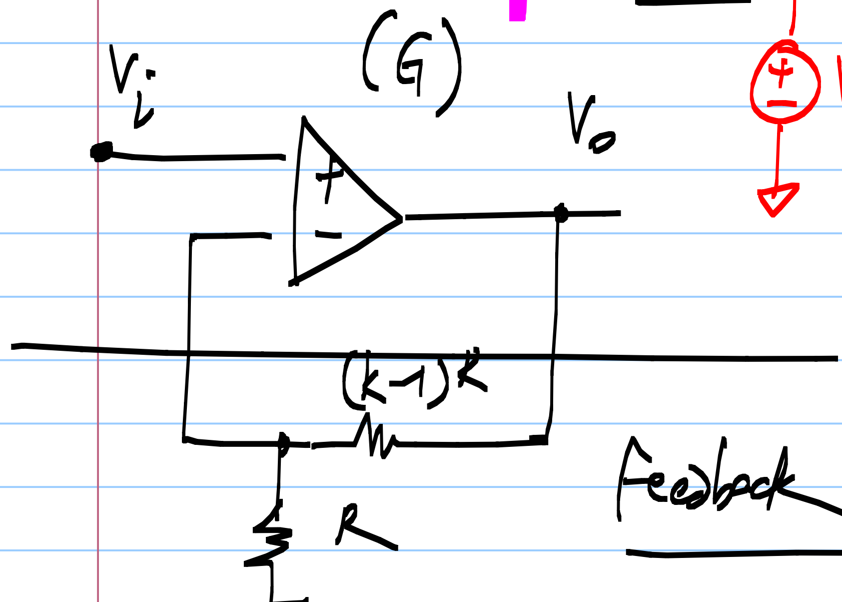




$V_{RETURN} = -GH \cdot V_{TEST}$

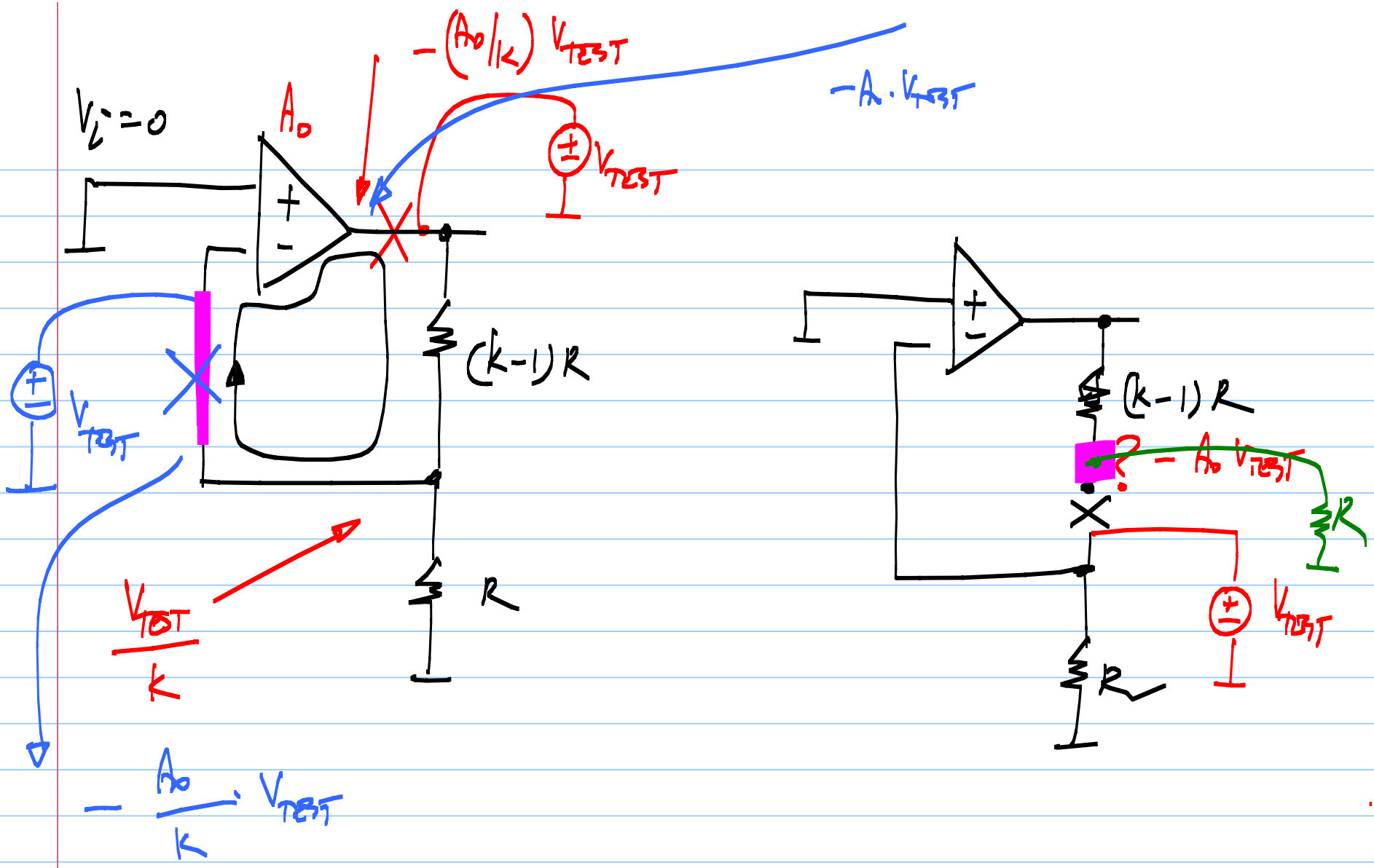
loop gain

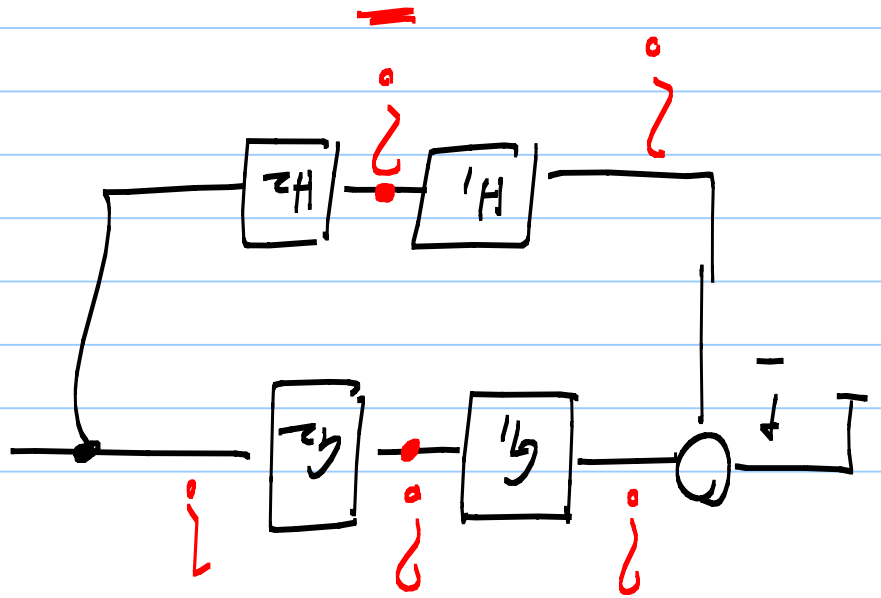
$$\frac{Y}{X} = \frac{G}{1+GH} = \frac{1}{H} \cdot \frac{1}{1+\frac{1}{GH}}$$

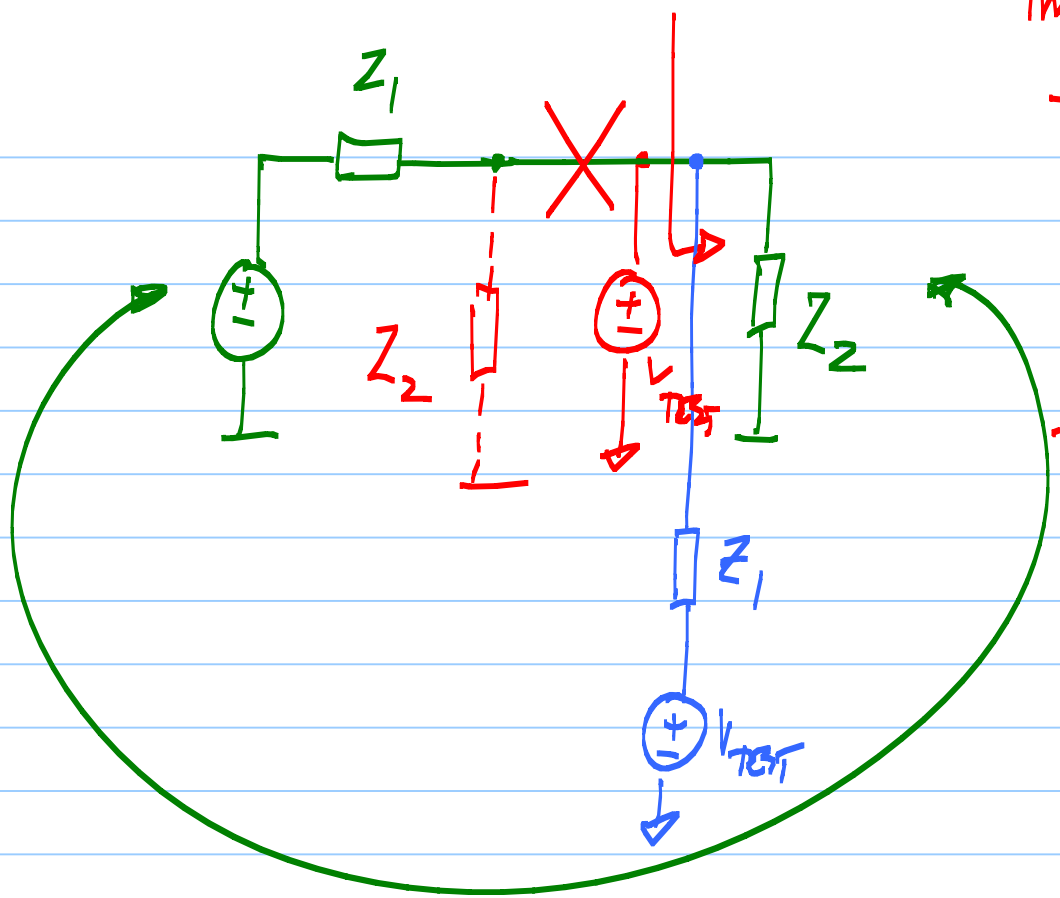


Feedback (H)

$$\frac{V_o}{V_i} = k \cdot \frac{1}{1+\left(k/A_o\right)}$$


$V_i = 0$
A_0
$-(A_0/k)\,V_{TEST}$
V_{TEST}
$(k-1)R$
V_{TEST}
R
$\frac{V_{TEST}}{k}$
$-\frac{A_0}{k}\cdot V_{TEST}$
$-A\cdot V_{TEST}$
$(k-1)R$
$-A_0 V_{TEST}$
R
V_{TEST}
R


H_2
H_1
G_2
G_1



Impedance seen after the break must be added before the break

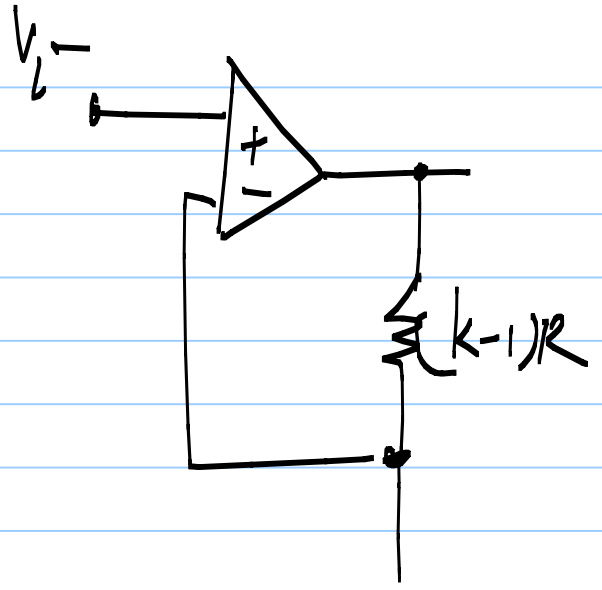
$$\frac{k}{\left(1+\frac{k}{A_0}\right)} \simeq k\left(1-\frac{k}{A_0}\right)$$

$$\frac{A_0}{k} \gg 1$$

$k = 10$ $\quad$ 9.99 $\quad$ 10.01

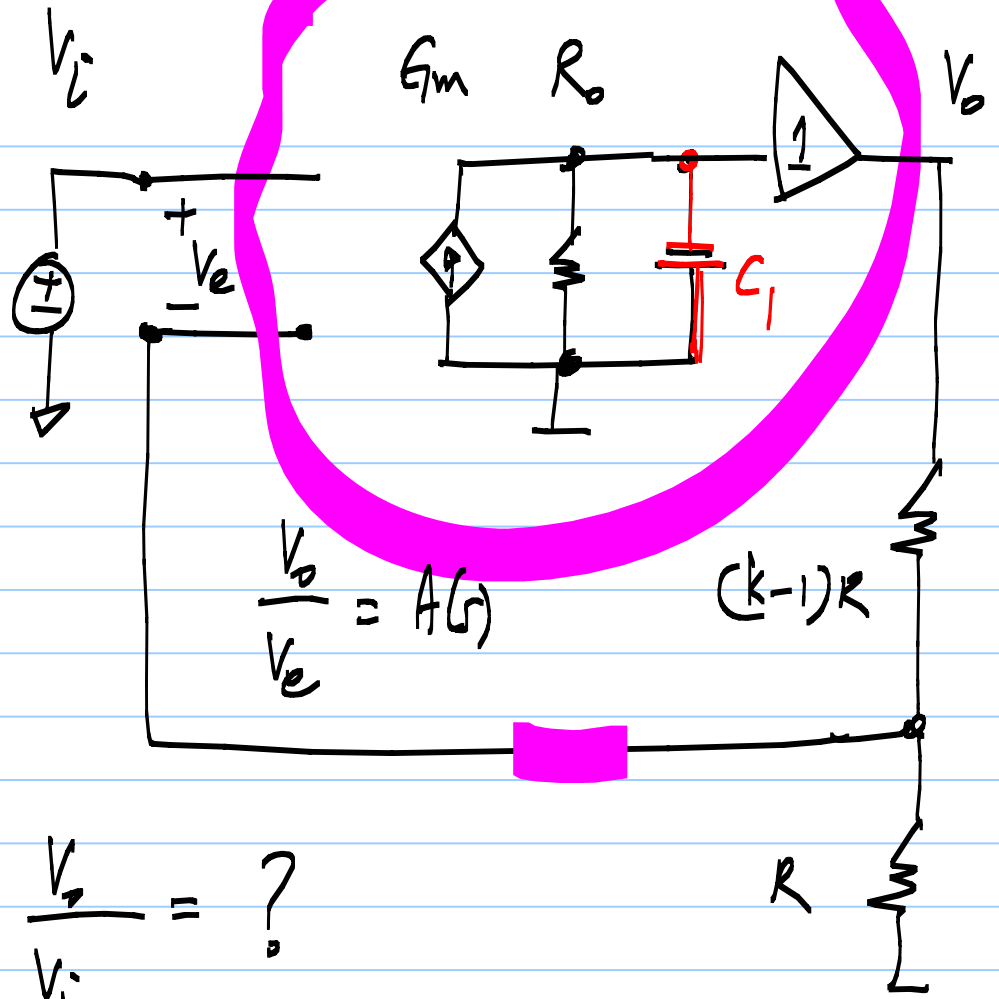
(0.1%)

$A_0 > 10{,}000$



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

$\equiv$



$$\frac{V_o}{V_i} = ?$$

$$A(s) = \frac{G_m}{G_o + sC_1} = \frac{G_m R_o}{1 + sG_1 R_o} = \frac{A_o}{1 + s/p_1}$$

$$\frac{V_o}{V_i} = \frac{k}{1 + k/A(s)} = \frac{k}{1 + \frac{k}{A_o}\left(1 + s/p_1\right)}$$

$$= \frac{k}{1 + \frac{k}{A_o} + \frac{s}{p_1 \cdot A_o/k}}$$