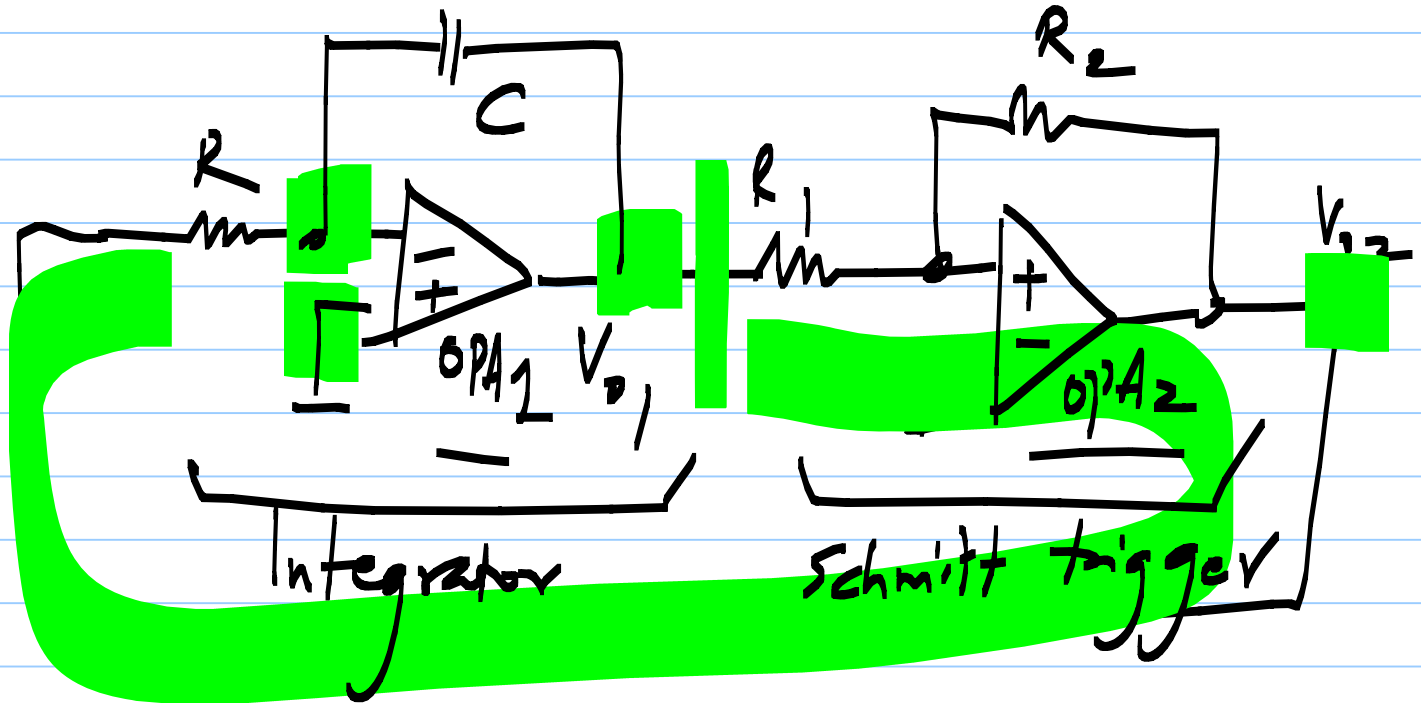
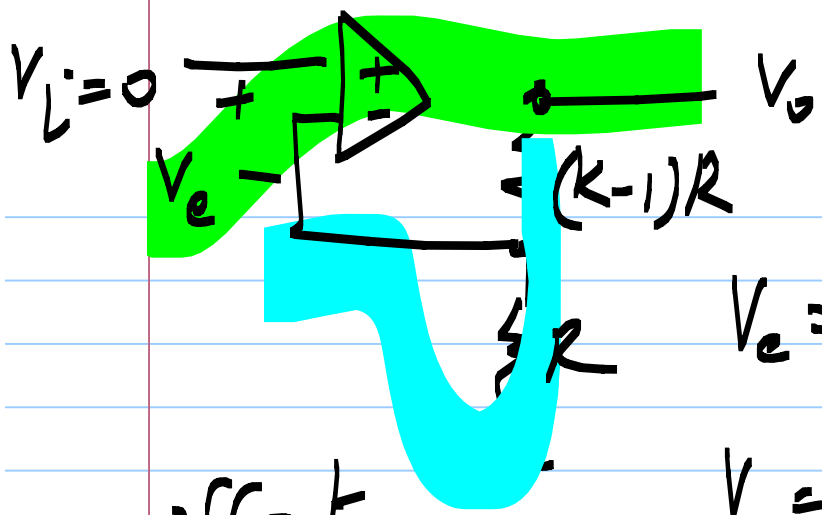
EE 209 Schmitt-trigger oscillator 2/2/2018



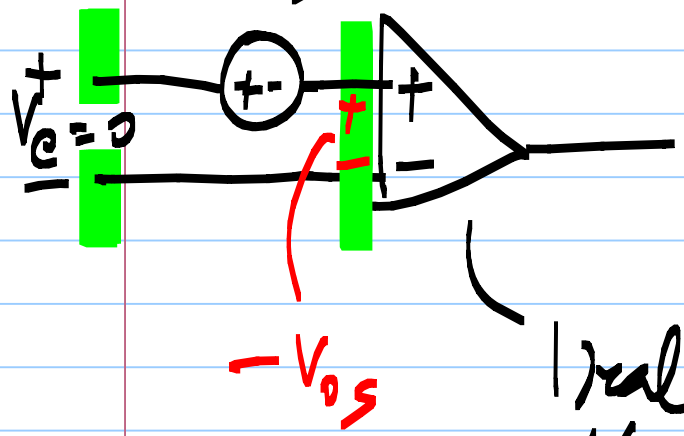


$$V_e = -\frac{V_o}{k}$$

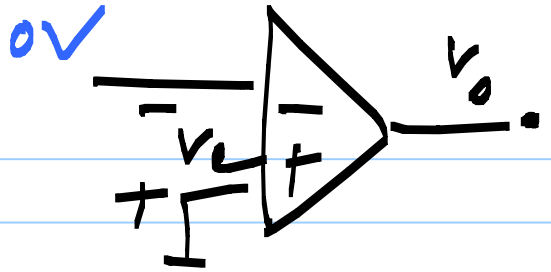
$$V_o = -kV_e$$

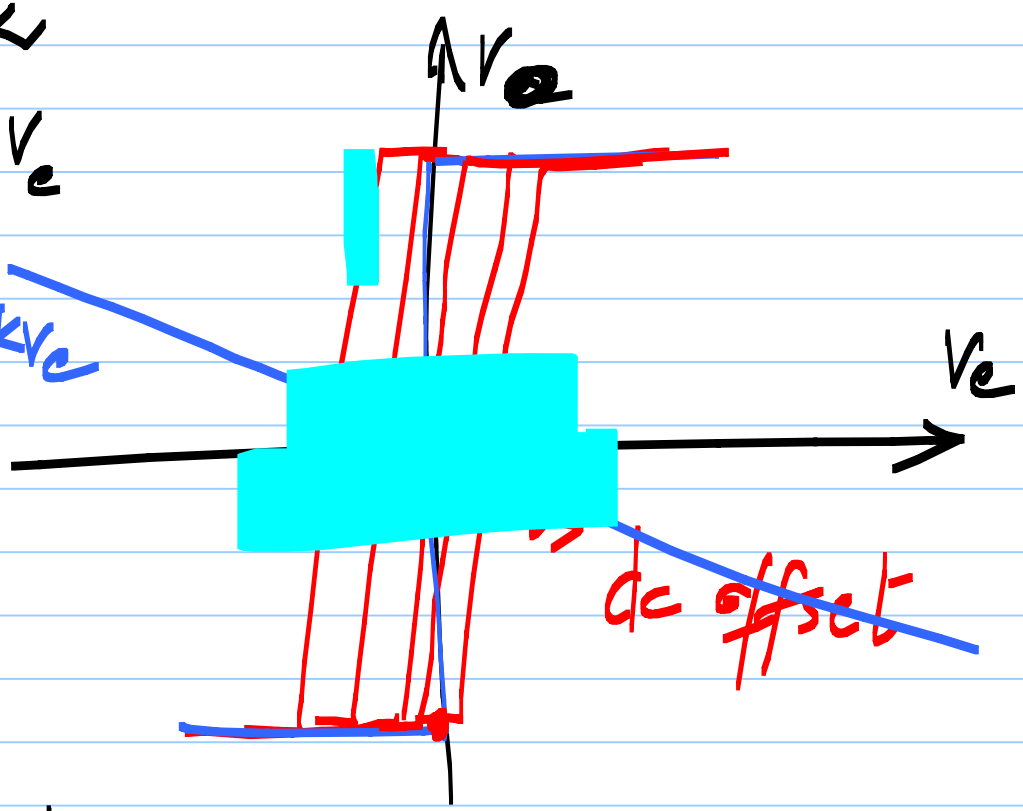
offset voltage

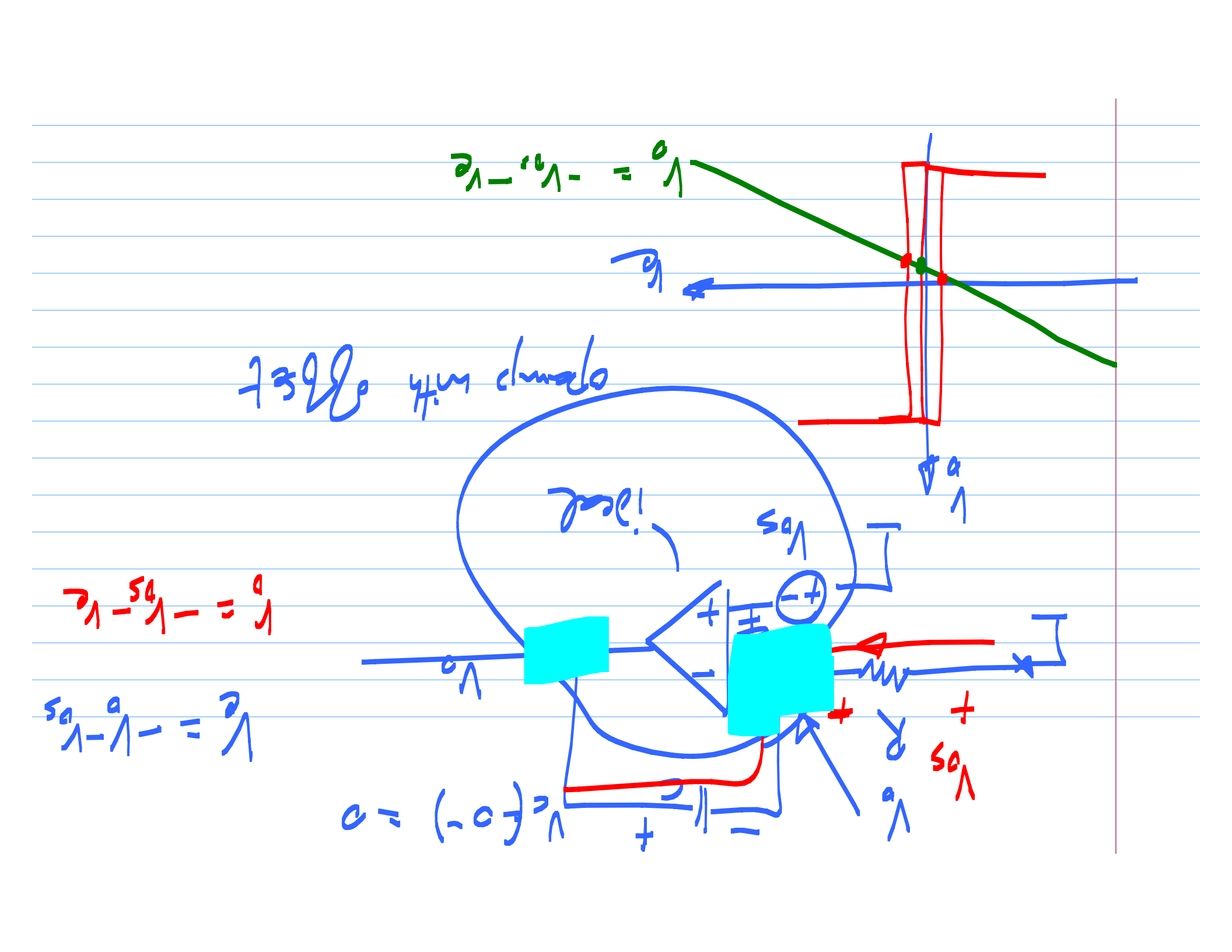
V_{os}



Ideal opamp w/ no offset

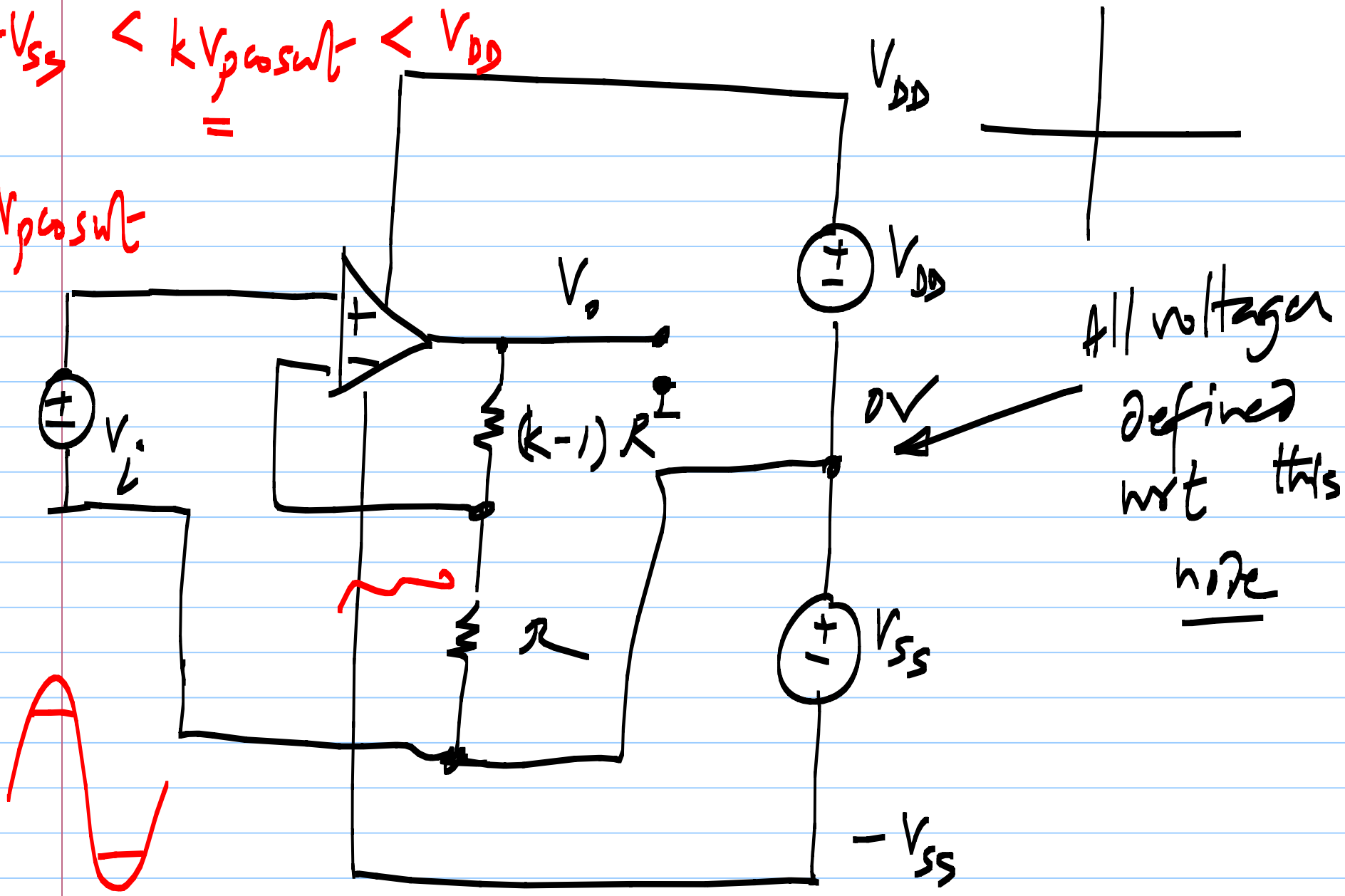




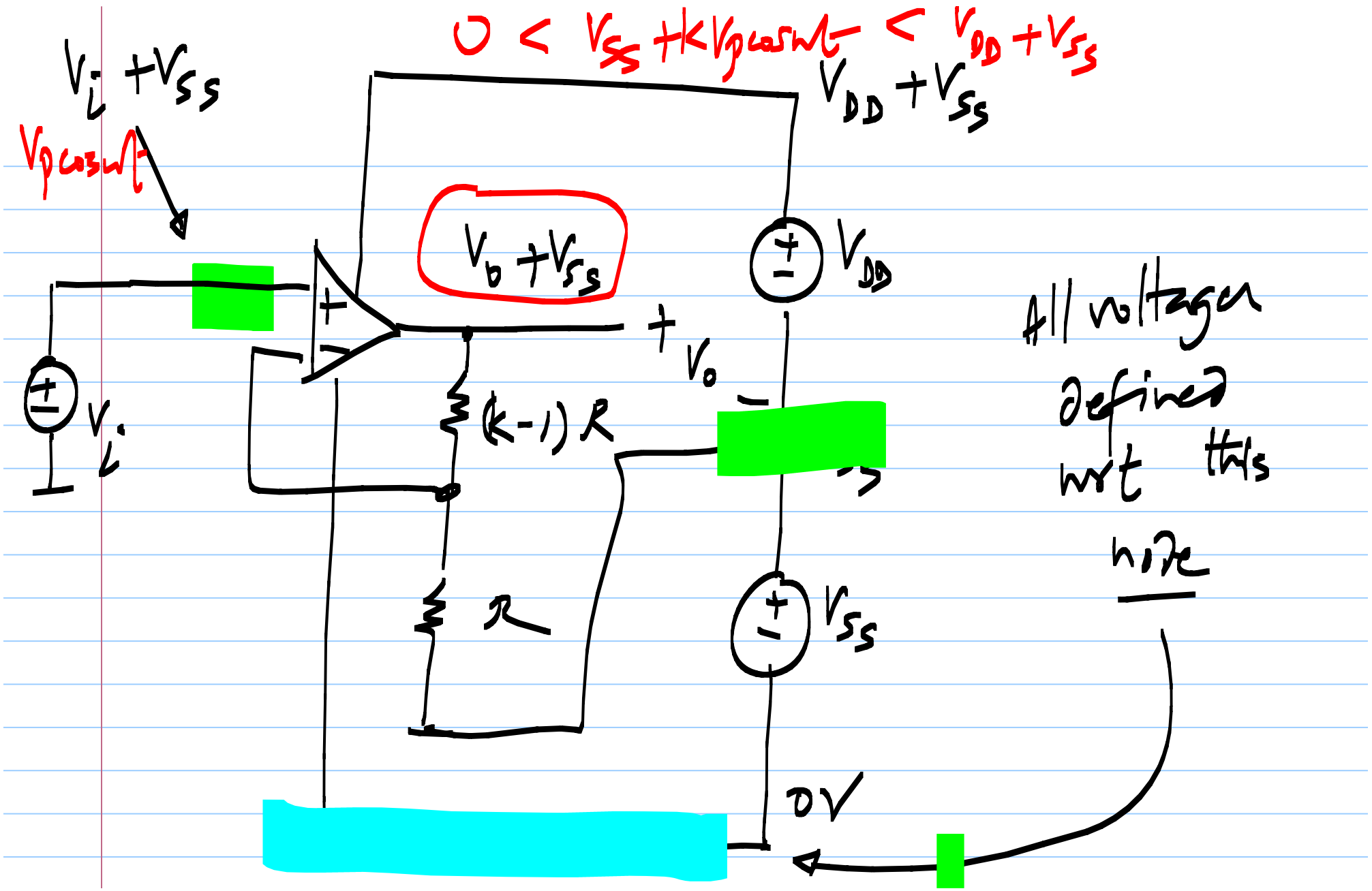


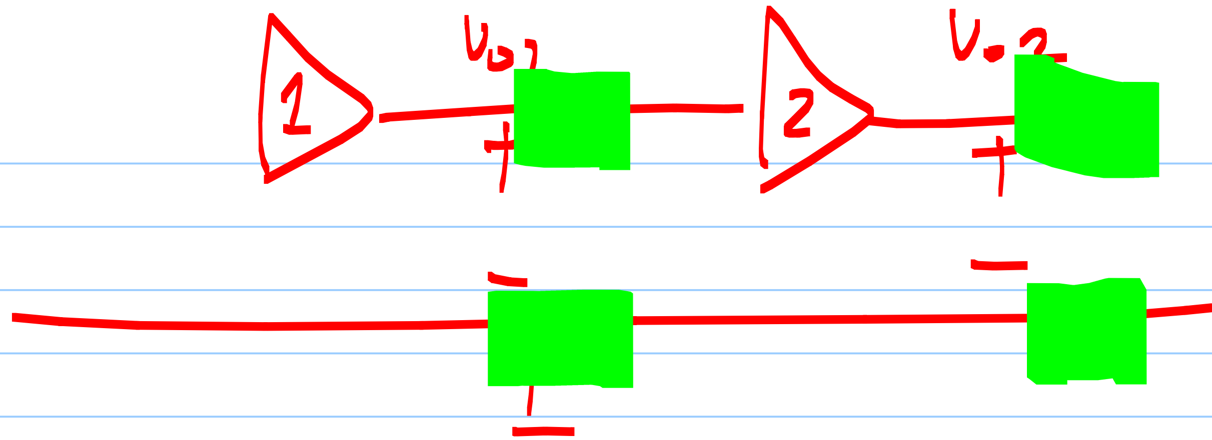
$-V_{SS} < kV_p \cos\omega t < V_{DD}$

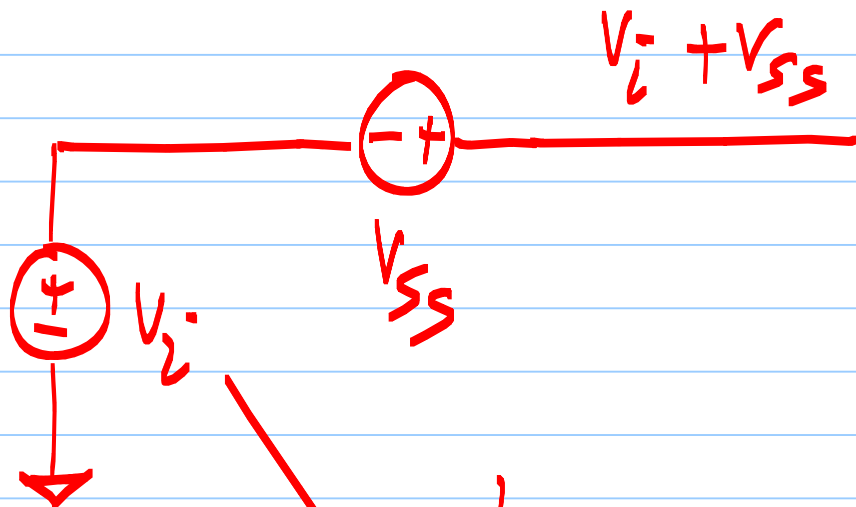
$V_p \cos\omega t$



All voltages defined wrt this node


$0 < V_{ss} + kV_p \cos\omega t < V_{DD} + V_{ss}$
$V_i + V_{ss}$
$V_p \cos\omega t$
$V_{DD} + V_{ss}$
$V_o + V_{ss}$
V_{DD}
$+ V_o -$
V_i
$(k-1)R$
R
V_{ss}
0V
All voltages defined wrt this node

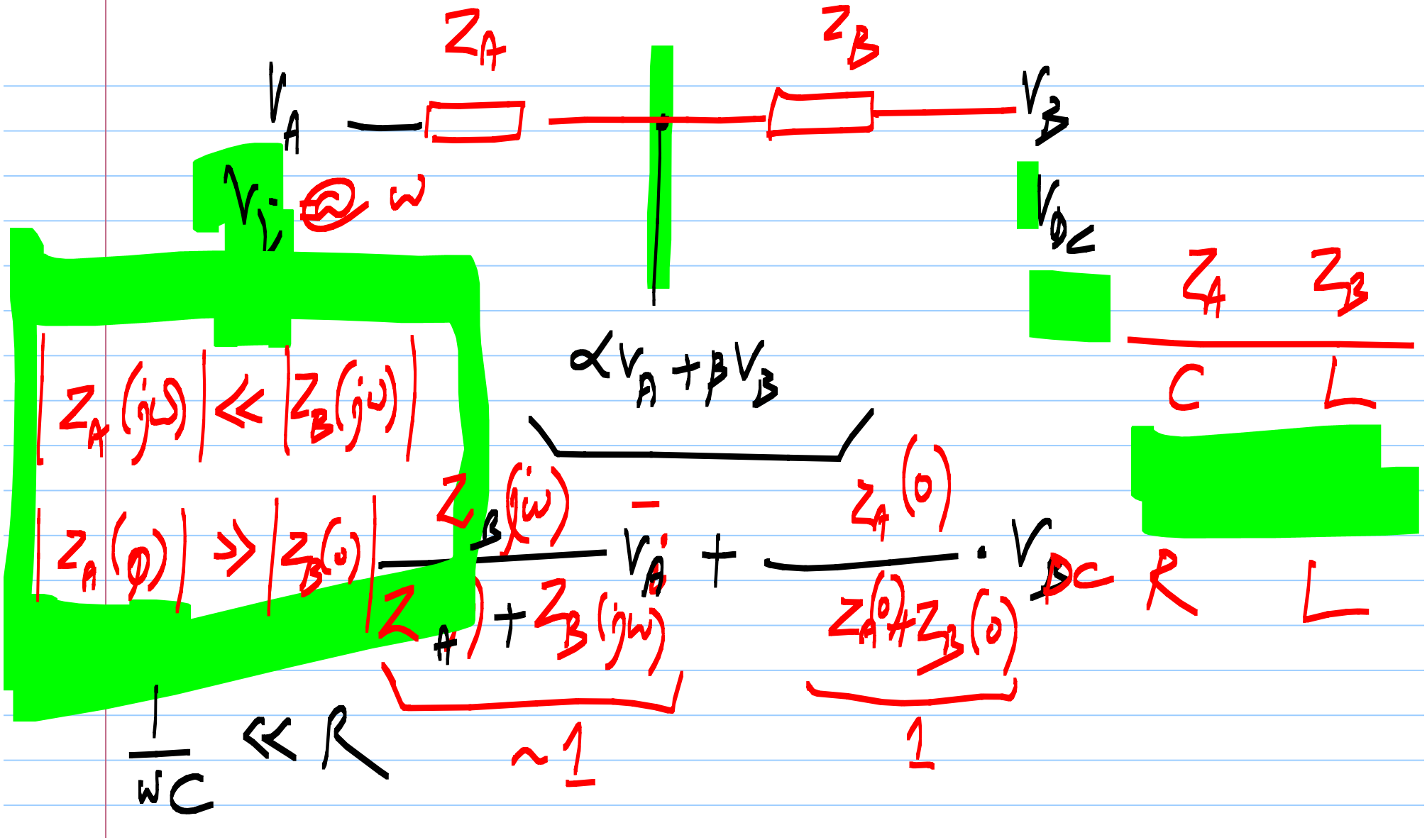


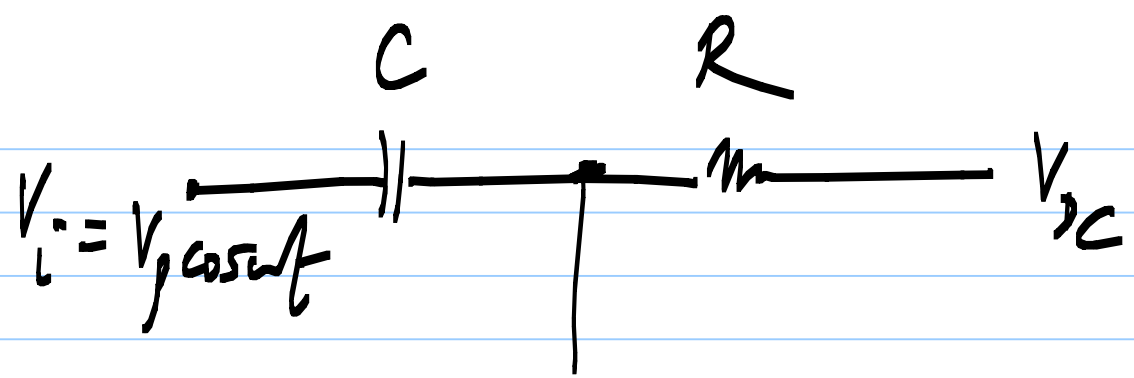


not dc

$V_p \cos \omega t$

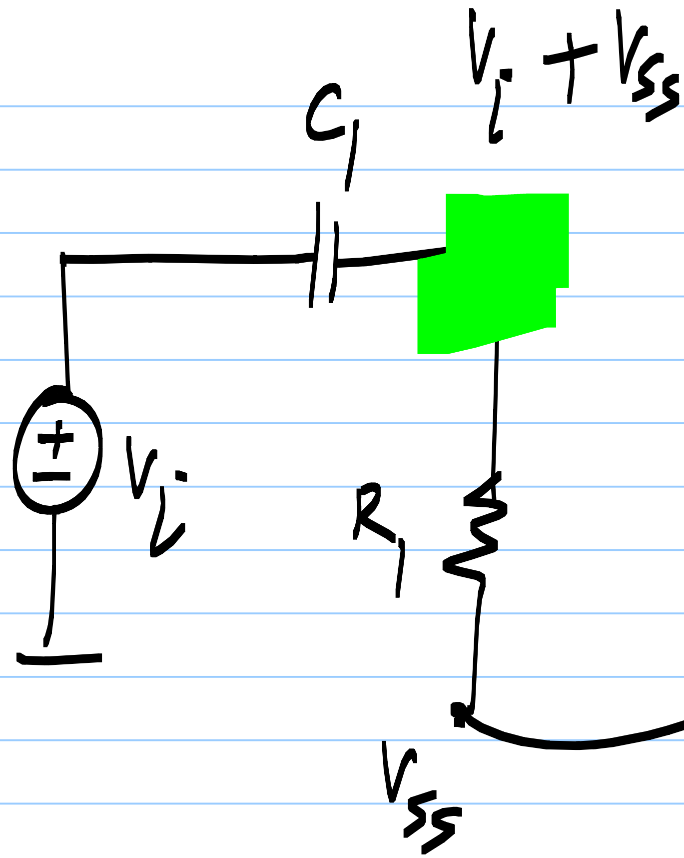
$\omega > 0$

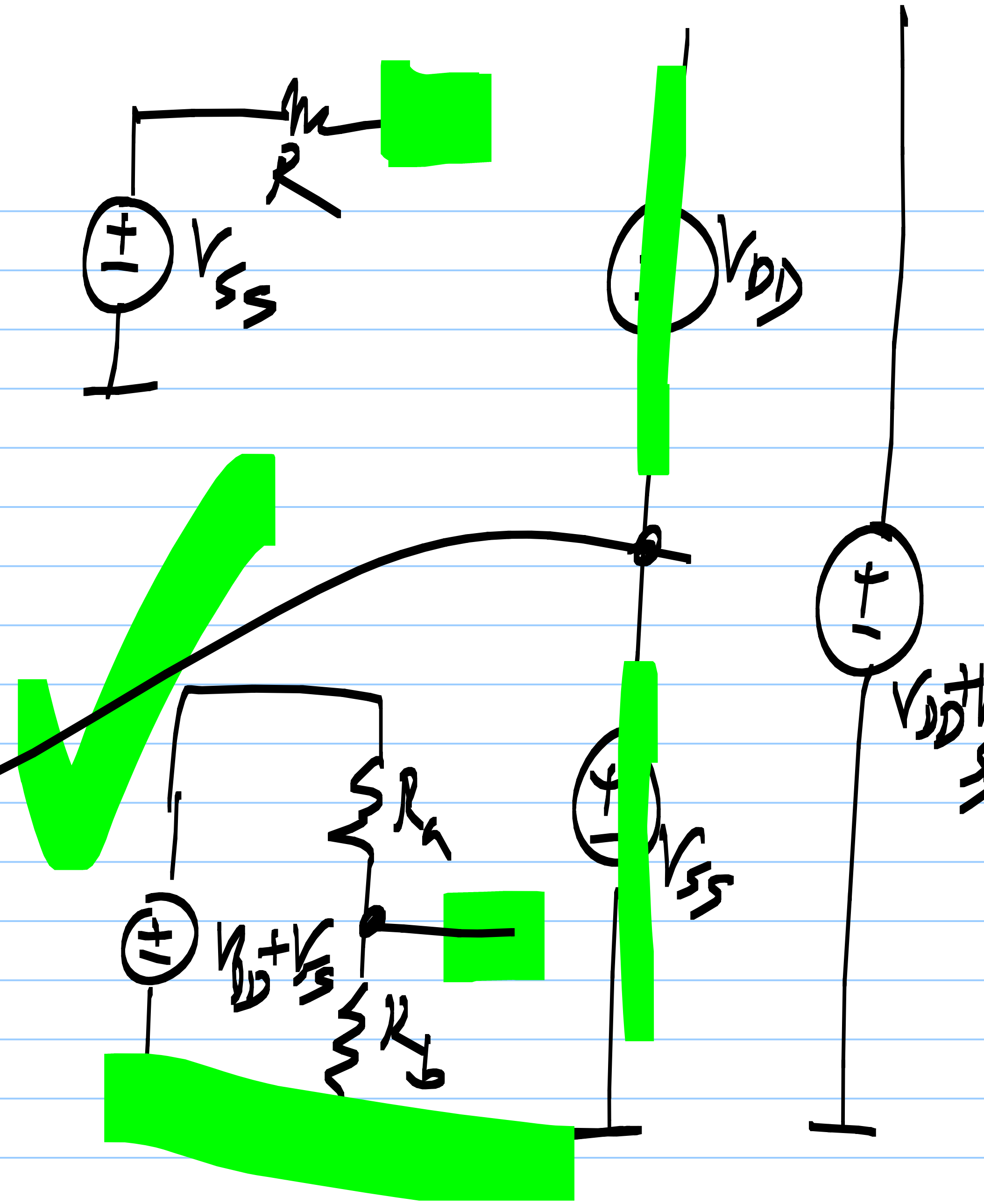

Z_A
Z_B
V_A
V_B
V_i @ ω
V_{DC}
$\alpha V_A + \beta V_B$
$|Z_A(j\omega)| \ll |Z_B(j\omega)|$
$|Z_A(0)| \gg |Z_B(0)|$
$\frac{Z_B(j\omega)}{Z_A(j\omega)+Z_B(j\omega)} V_A + \frac{Z_A(0)}{Z_A(0)+Z_B(0)} \cdot V_{DC}$
~ 1
1
$\frac{1}{\omega C} \ll R$
Z_A Z_B
C L
R L



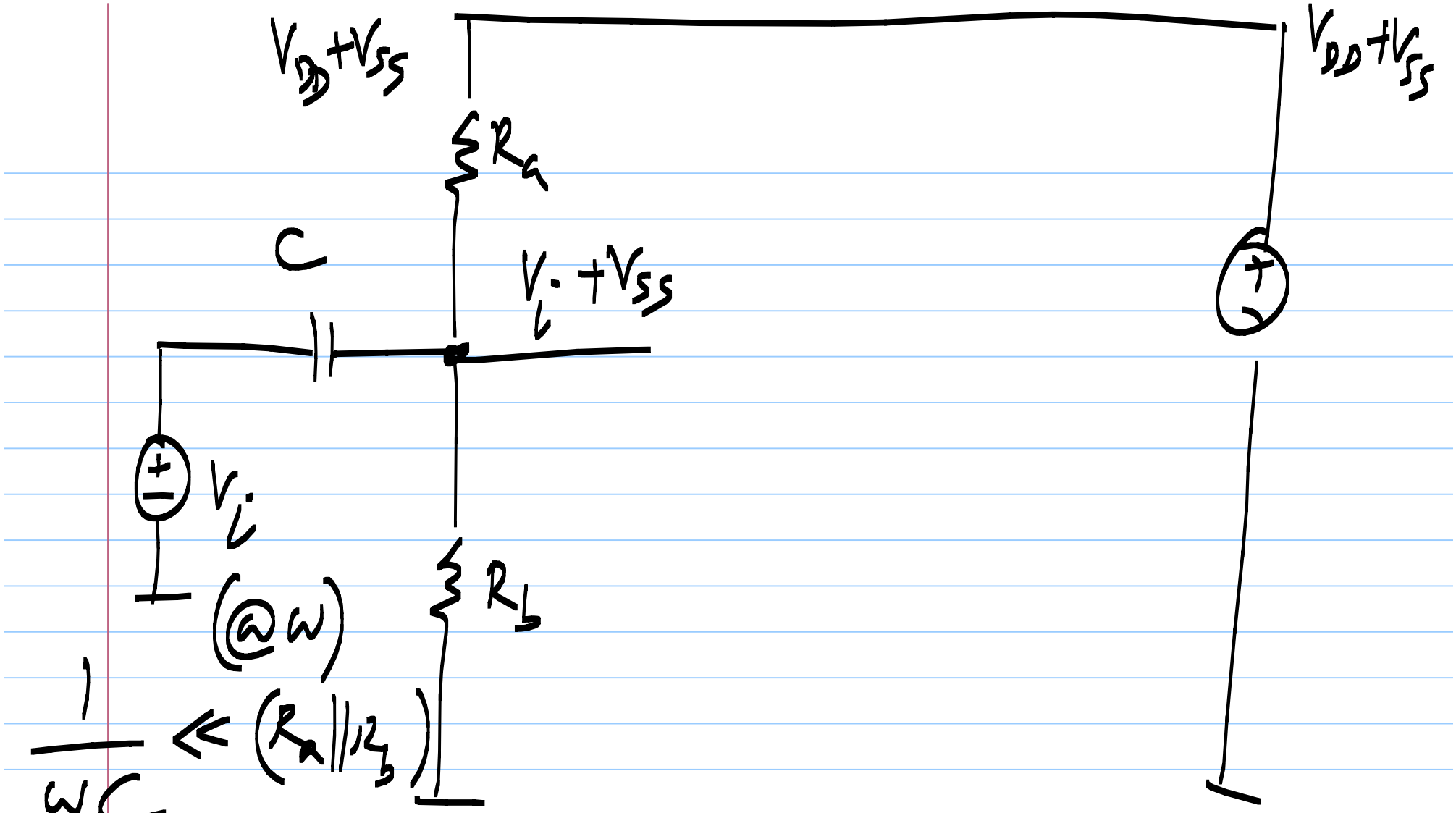
$\simeq V_p \cos \omega t + V_{DC}$ if $\frac{1}{\omega C} \ll R$

Add dc & ac : ac coupling network





$$\frac{R_b}{R_a+R_b} \cdot (V_{DD}+V_{ss}) = V_{ss}$$


$V_{DD}+V_{SS}$
R_A
C
V_i+V_{SS}
V_i
(@ω)
R_L
$\frac{1}{\omega C} \ll (R_A \| R_L)$
$V_{DD}+V_{SS}$