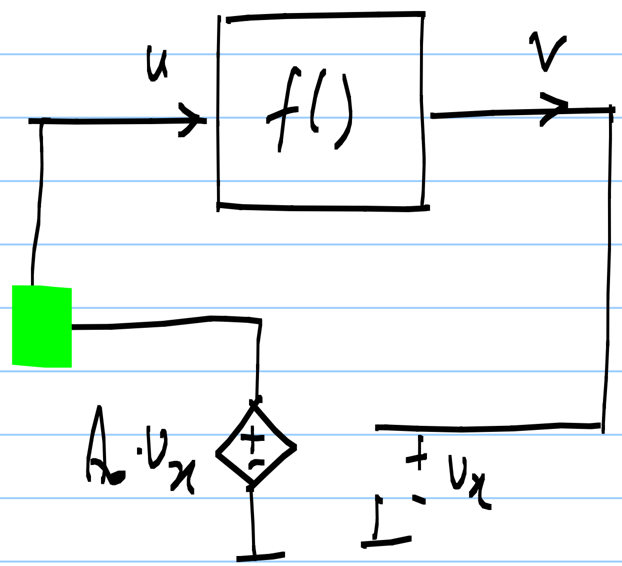
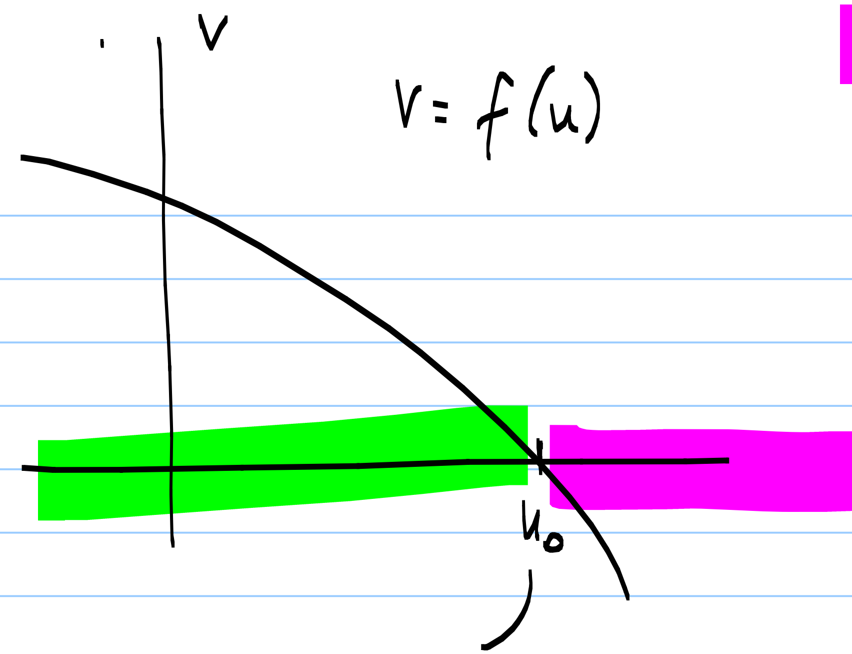
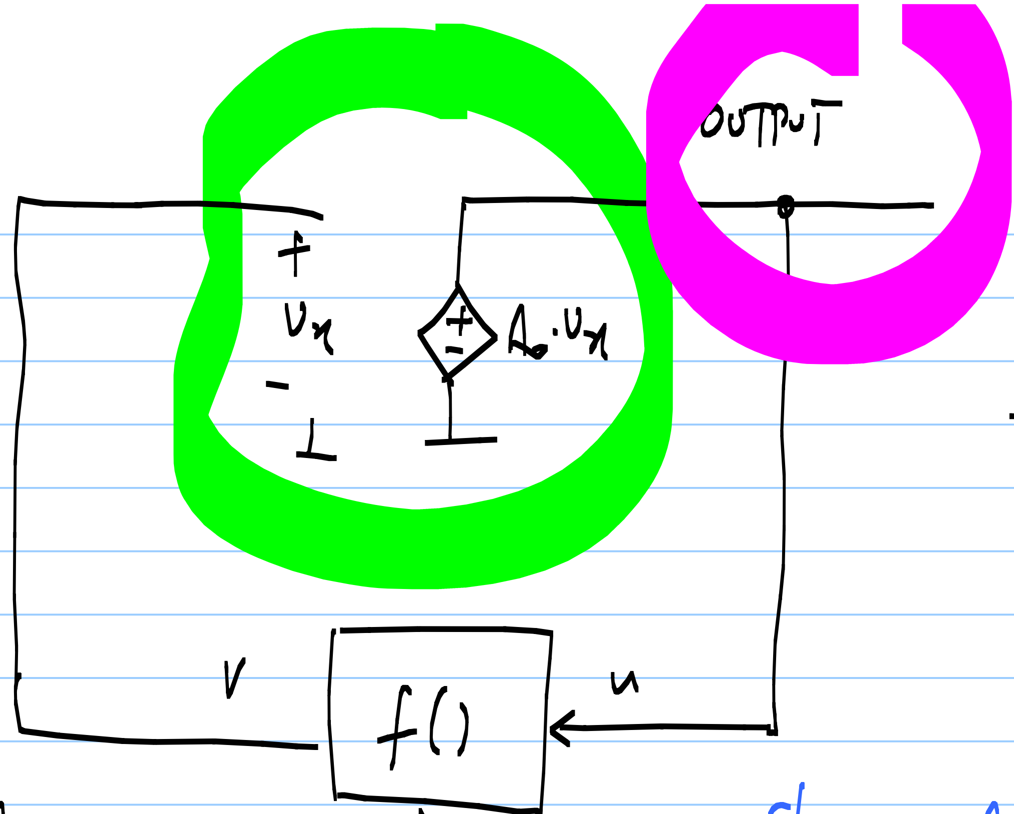
Lecture 18

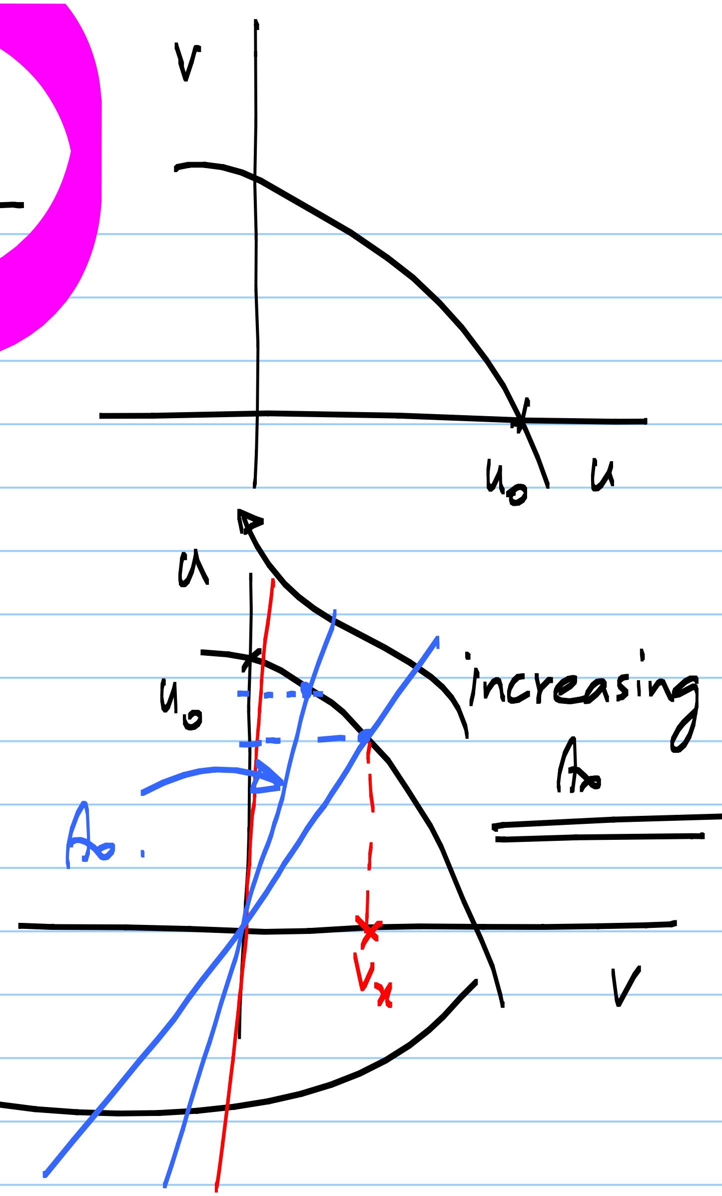




Solving $f(u) = 0$ means finding u_0 such that

$$f(u_0) = 0$$





For $A_\infty \to \infty$,

output $u = u_o$

$u_o : f(u_o) = 0$

$V_o = kV_i$

V_i: input voltage

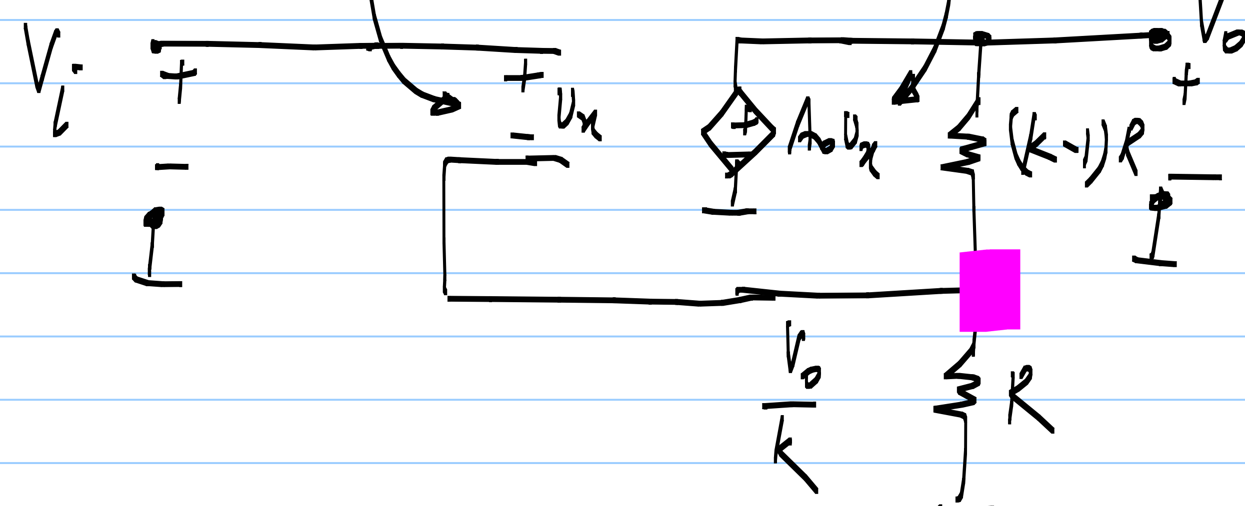
V_o : output voltage

$V_o - kV_i = 0$ (don't have kV_i)

$\frac{V_o}{k} - V_i = 0$ ✓

$A_o\left(V_i - \frac{V_o}{k}\right) = V_o$

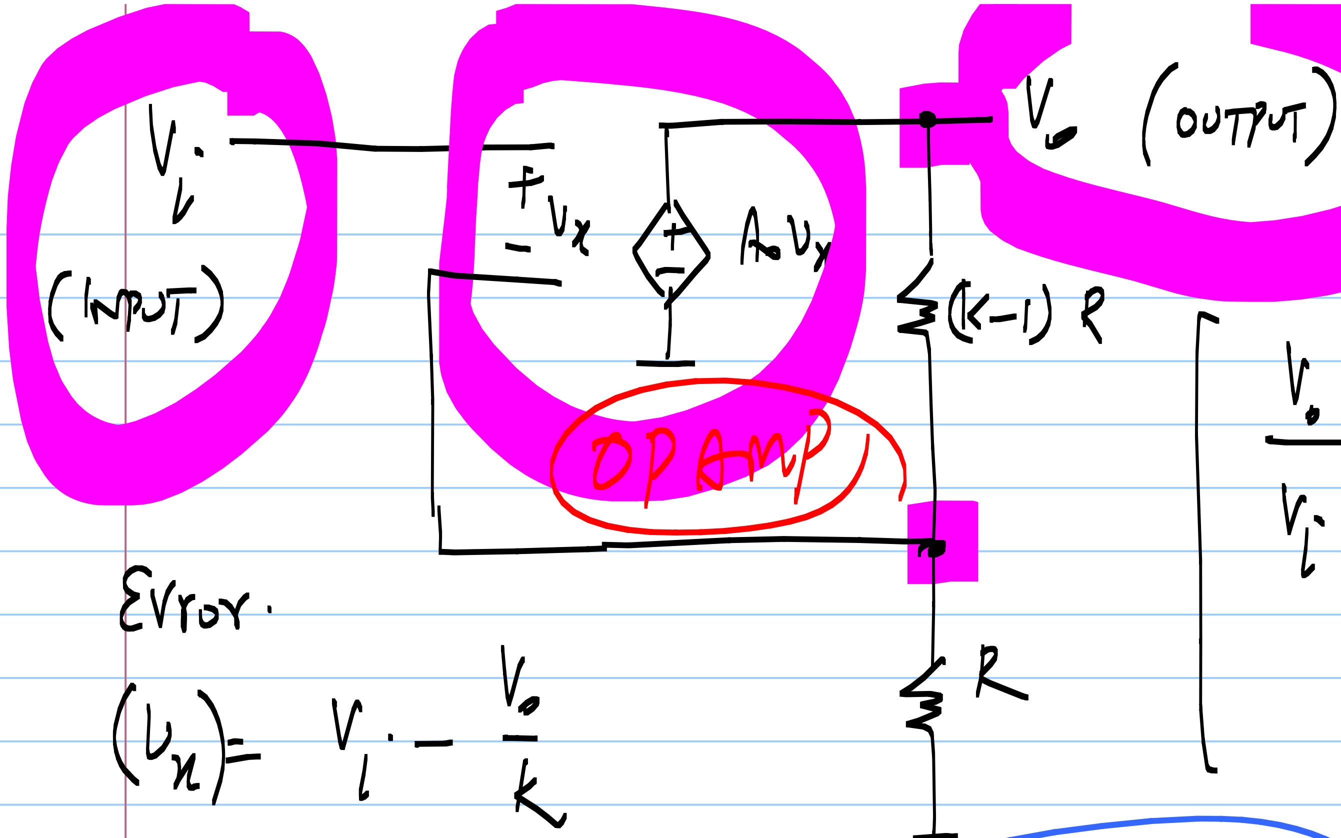
$(V_i - V_o/k)$



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

$$\left[\frac{1}{1 + \left(\frac{k}{A_o}\right)} \right] \longrightarrow 1$$

if $A_o \rightarrow \infty$



$k = 10$

$A_o = 1000$

$A_o = 2000$

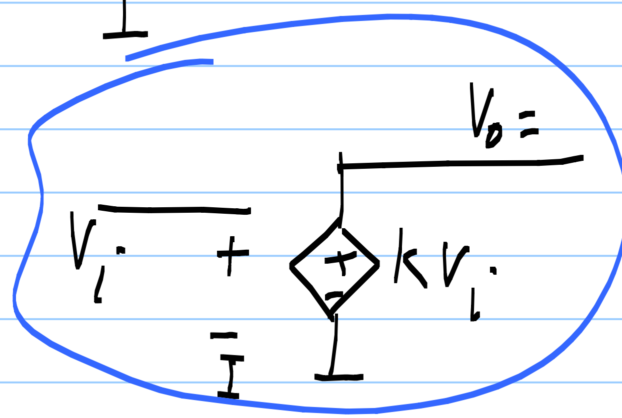
$$\frac{V_o}{V_i} = \frac{k}{\left(1 + \frac{k}{A_o}\right)} \simeq k \quad A_o \to \infty$$

Error.

$$(v_x) = V_i - \frac{V_o}{k}$$

Desired:

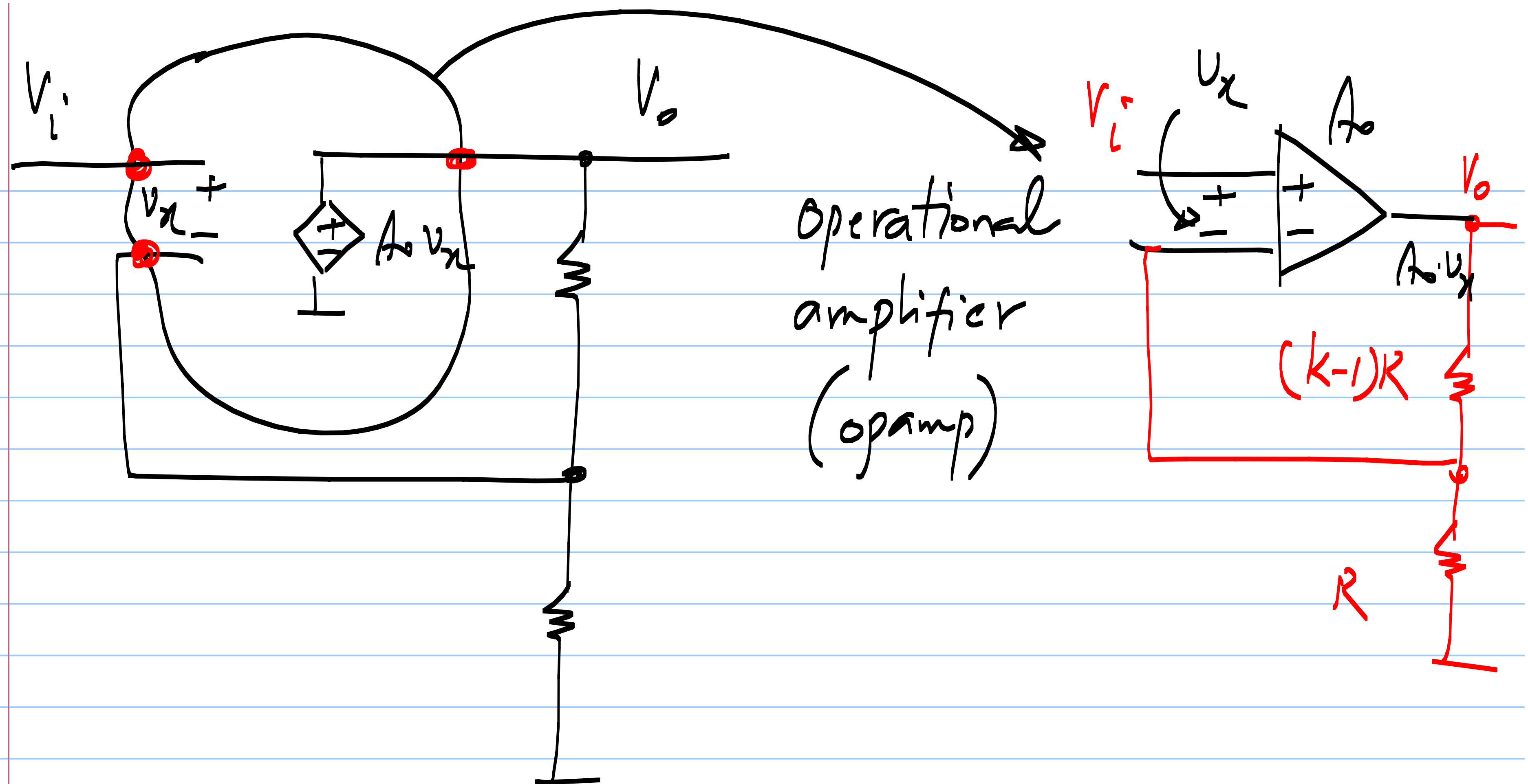
$$V_o = k \cdot V_i$$



$$\frac{10}{1.01}$$

$$\frac{10}{1.02}$$

$$\frac{10}{1.005}$$



V_i
v_x
$A_0 v_x$
V_o
operational amplifier (opamp)
v_x
A_0
$A_0 \cdot v_x$
$(k-1)R$
R