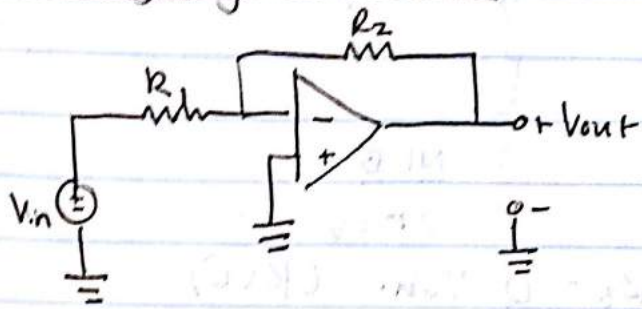
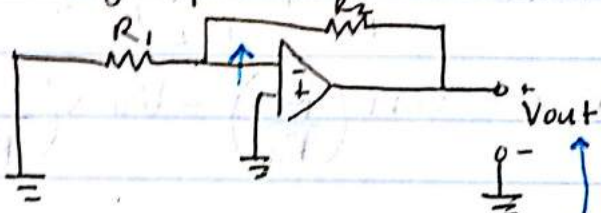
05/15

checking negative feedback



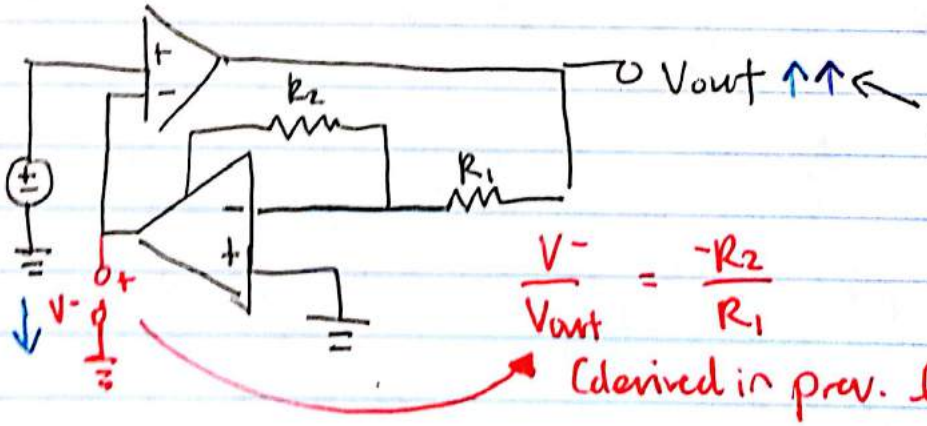
(1) set any input to 0.



ding ding neg. feedback.

(2) "Dink the Vout".

$$\rightarrow V^- = \frac{V_{out} \cdot R_1}{R_1 + R_2}$$



pos. feedback.

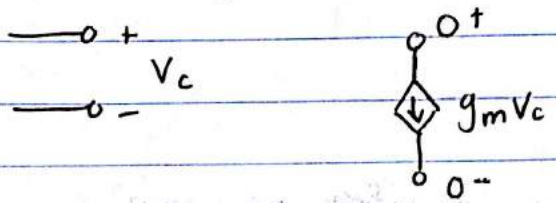
$$\frac{V^-}{V_{out}} = \frac{-R_2}{R_1}$$

(derived in prev. lecture)

Design Example

Using only resistors and op amps (& V.srcs), implement a current source whose value is proportional to a control voltage.

Step 1 State goal. (VCCS)



◇ dependent current source

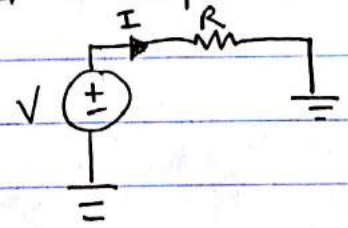
Ⓘ independent current source

Step 2 Describe a strategy

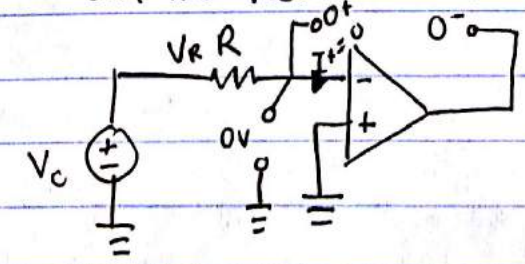
Ohm's Law: $V = IR$, $I = V/R$

Step 3 Implement the strategy

$$I = \frac{V}{R}$$



but we need 4 nodes.... and we don't want current to flow back into V.

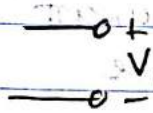


Step 4: Verify

$V_c = V_R$

$I = \frac{V_R}{R} = \frac{V_c}{R} \iff g_m V_c = I.$

Problem:



V_c is open,

So we connect V_c to a "buffer op-amp".