

Final Exam Q/A

Administrivia → H-w ll grades up! Pick em up
from lab
↳ Grades are getting up there*

* If you did cheat in the class & got away with it so far, I got news for u:
You WILL get screwed on the final
(But guarantees this!)
i.e.. You REALLY DIDN'T GET AWAY WITH IT!

What on the final:

Problem 1:
25 points
nodal
analysis

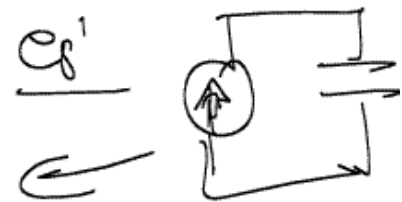
Problem 2:
25 points
op-amps

25 points
Problem 3:
Diodes /
RC, RL /
oscillators, flip flop

25 points
Problem 4:
Diodes
(graphical
method
etc)

N.B.: These will be a lab question (not
project) on the final. Not like: what is the
part number on your scope? No!

ie. lab circuits

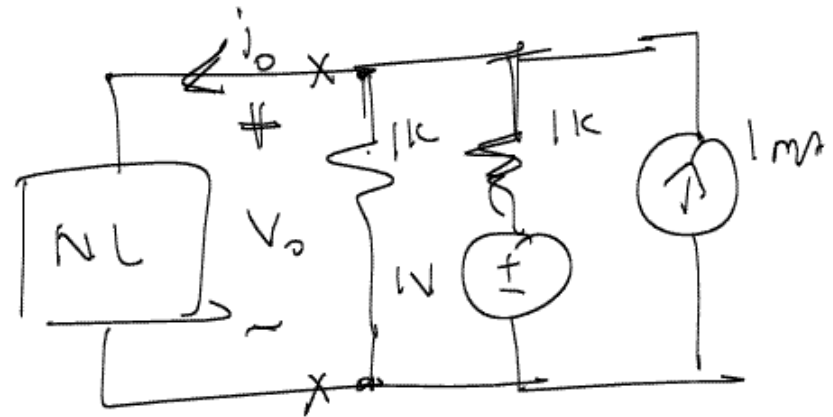
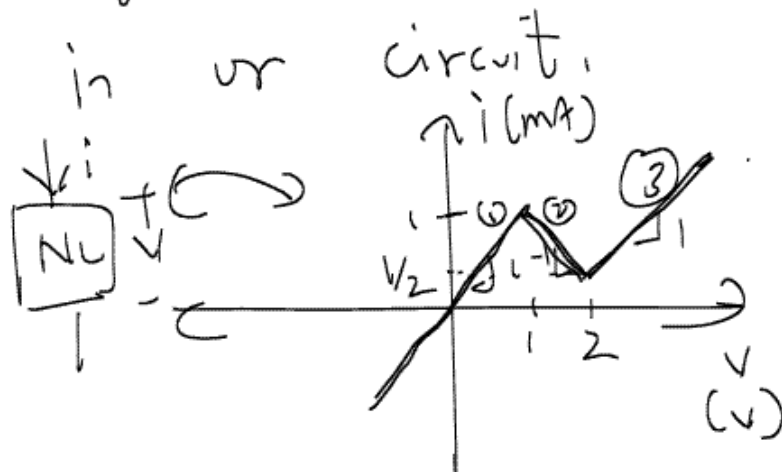


WORD OF ADVICE! → LEAVE NOTHING out (except
Project, PDP(CE) when you study for the final.

Best way to study → UNDERSTAND H.W.S
↳ understand exam problems
from previous semesters

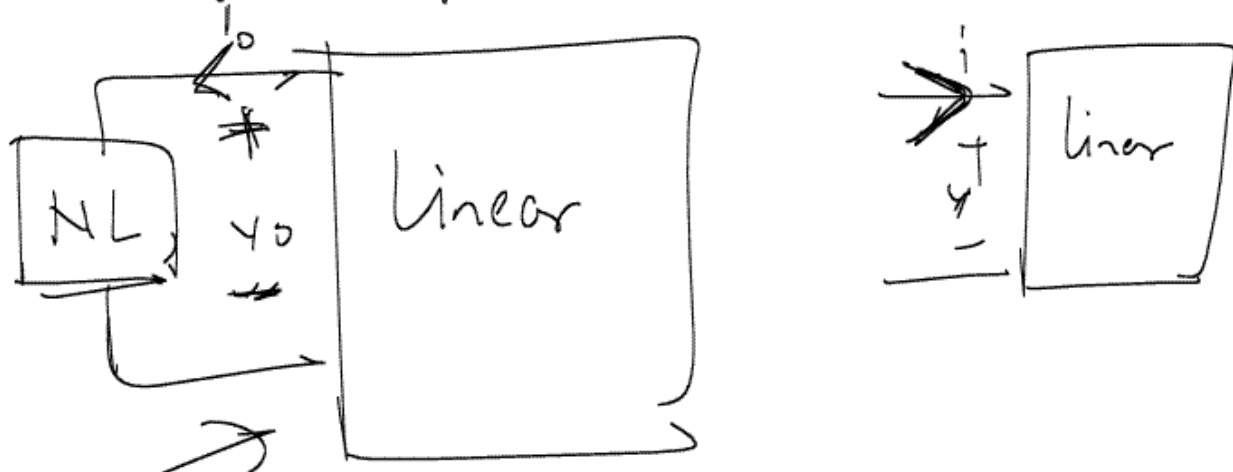
- Questions:
- (1) Load line method
 - (2) RC, RL
 - (3) Diodes

(1) Load line → Graphical way of solving circuits.
 Very useful if you have one nonlinear element

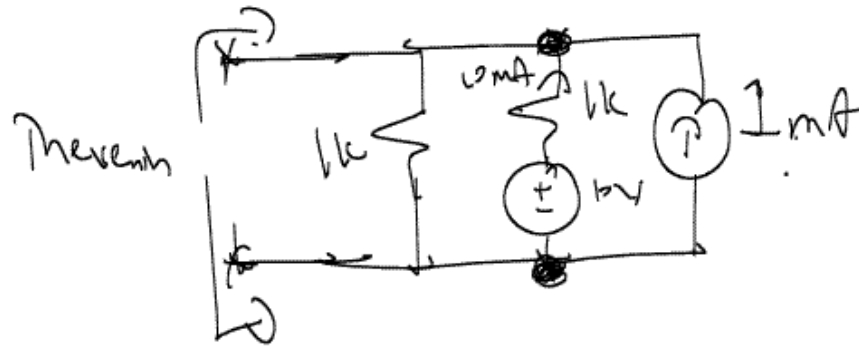


(Q.1) Find the operating point(s) for the circuit.

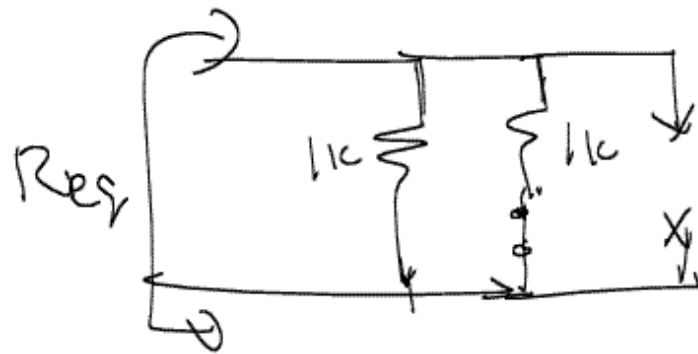
Ans:



Load line:

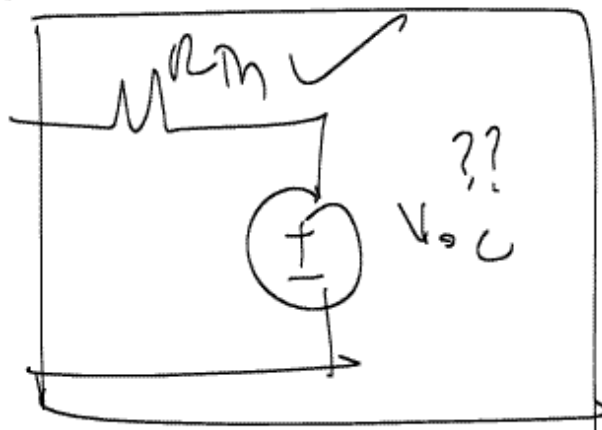


$R_M = ?$



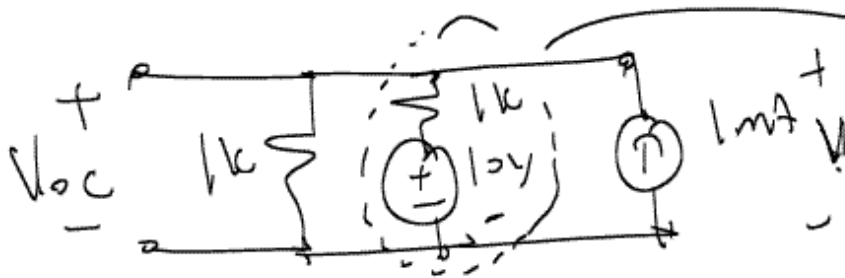
$$R_{Th} = R_{eq} = (1k) \parallel (1k) = \underline{\underline{500 \Omega}}$$

Note:

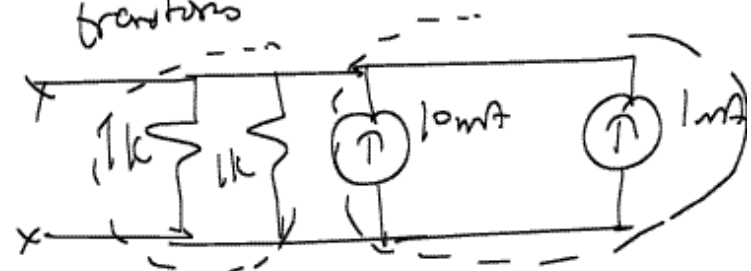


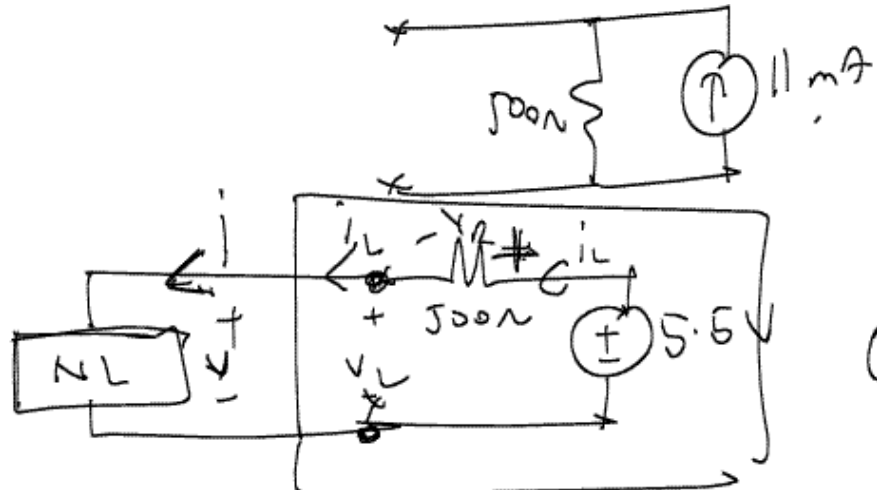
Linear

Recall: $V_{oc} = I_{sc} R_{Th}$



source
transform

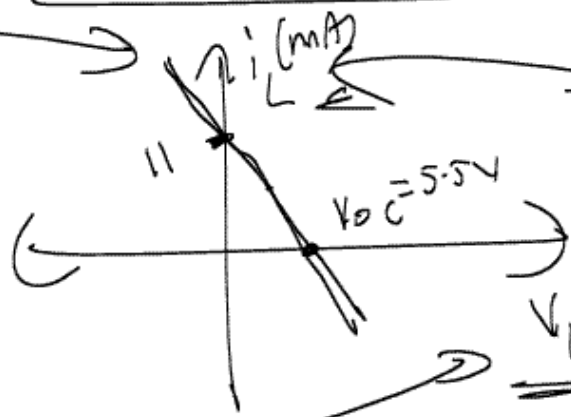
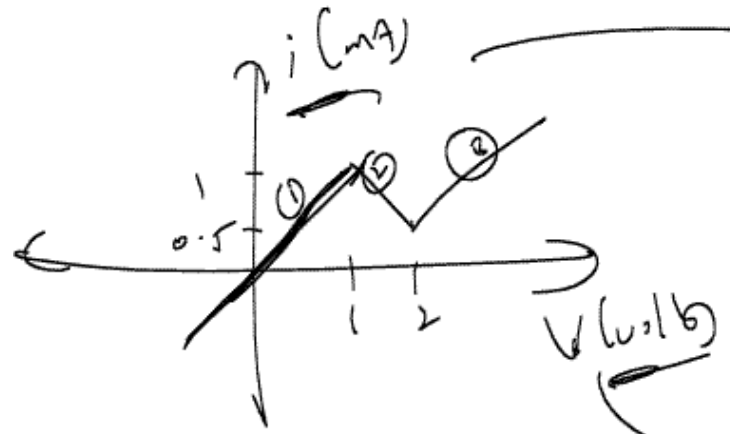




Ohm's law:

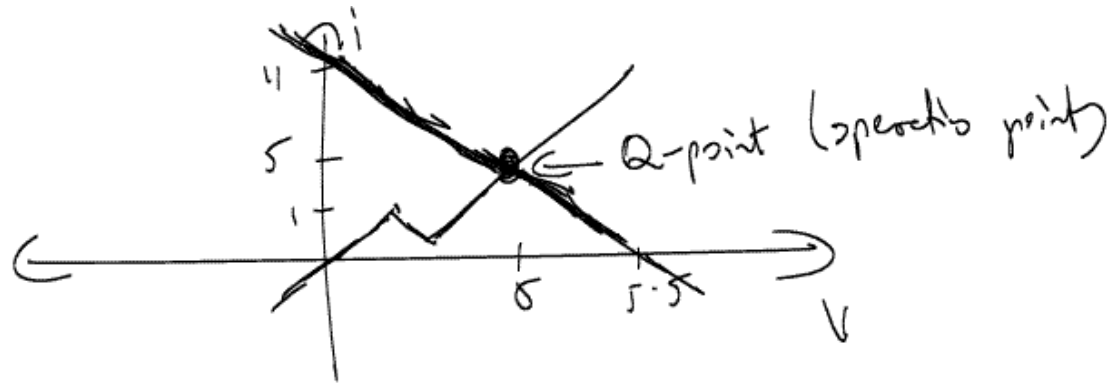
$$i_L = \frac{V_p}{500}$$

$$i_L = \frac{5.5 - V_L}{500}$$

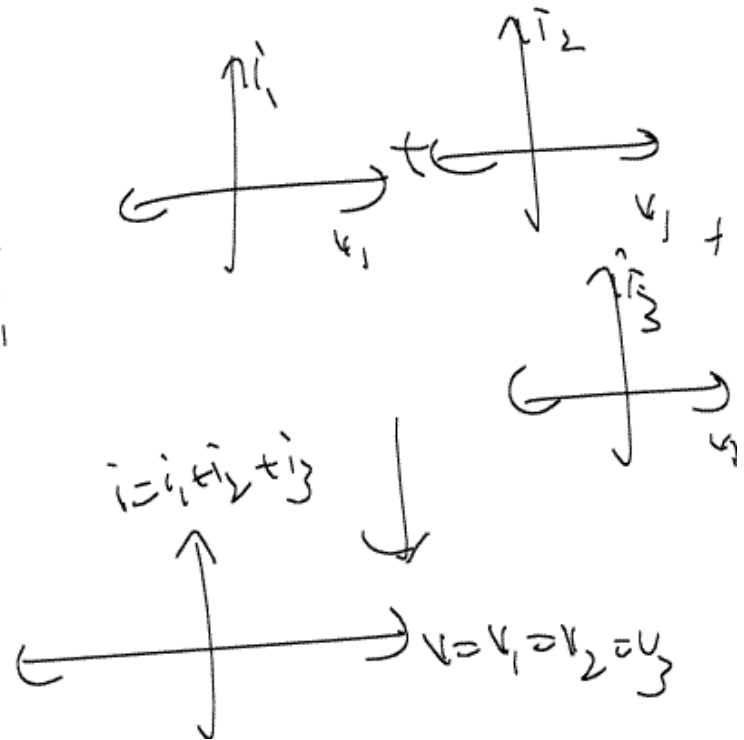
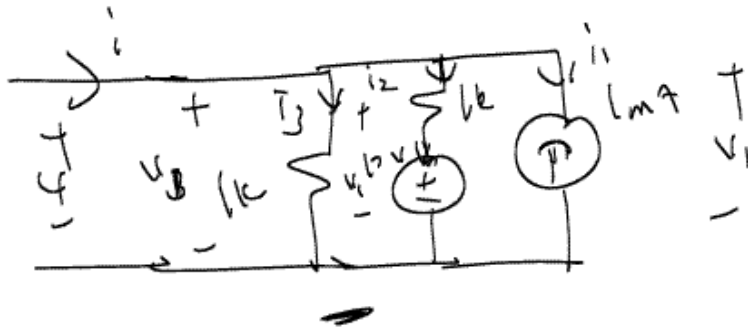


$$g = 2 - m \cdot c$$

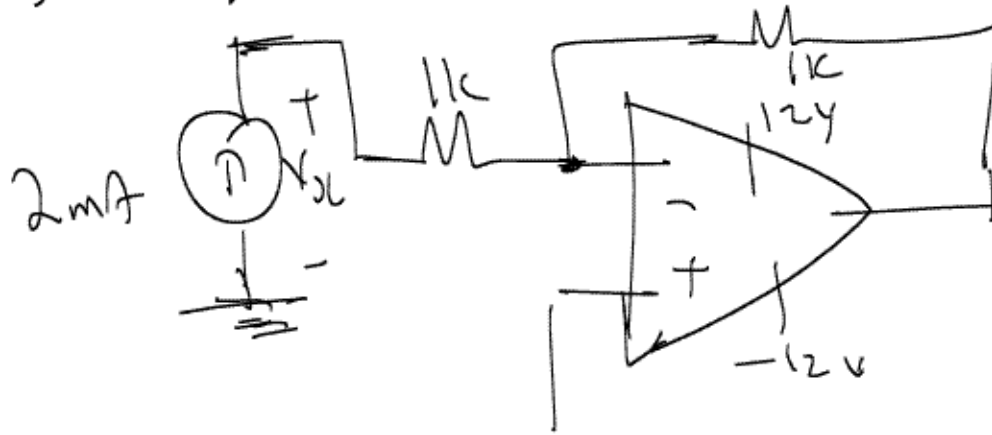
Sol:



Note: Tustin's method:



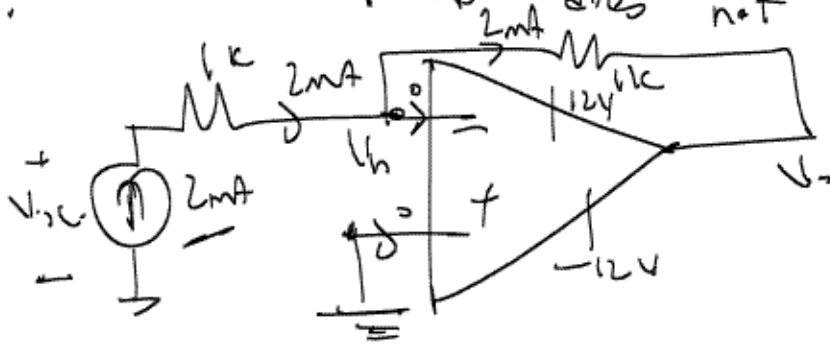
Q: Voltage across worst sources:



Find V_o .

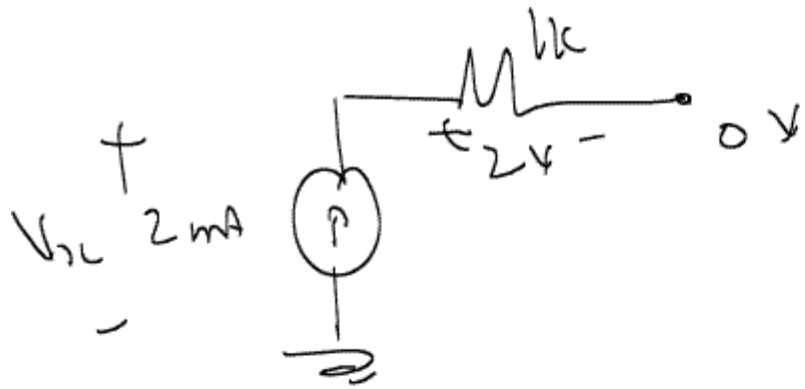
[DO NOT IGNORE
RAILS!]

Sol: Assume op-amp does not rail, find V_o & make sure



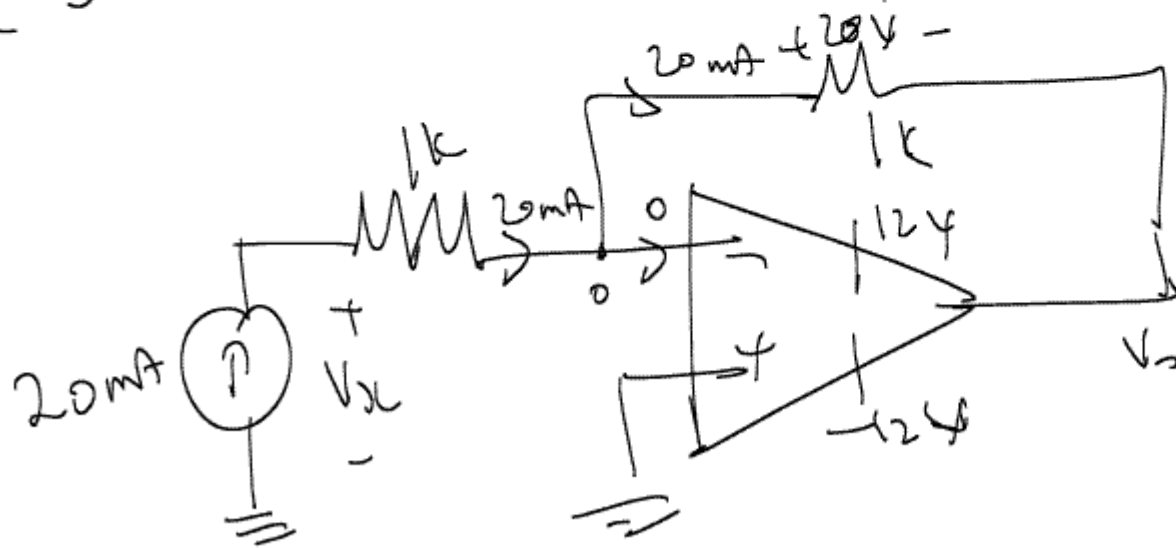
$12V < V_o < -12V$

$$\therefore \underline{V_n = V_p = 0} \quad \therefore V_o = -2V \in (12, -12V)$$



$$V_{OL} = 2\text{V}$$

(Q:) What if op-amp rails?

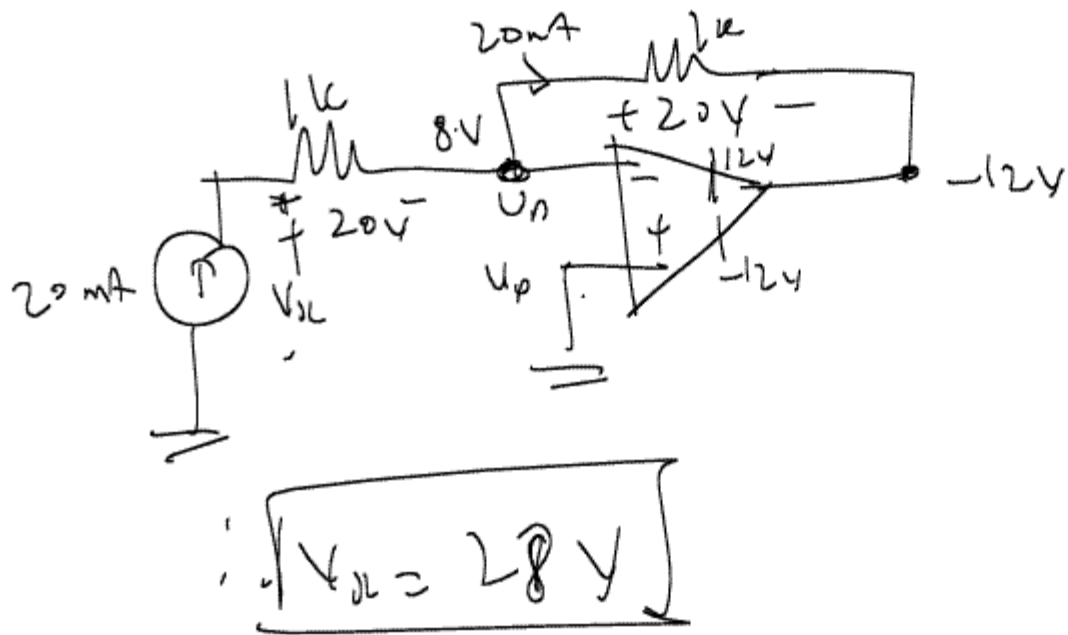


$$\text{If } V_n = V_p = 0,$$

$$\Rightarrow V_o = -20\text{V}$$

$$V_o = -12\text{V}$$

Op-amp RAILS!

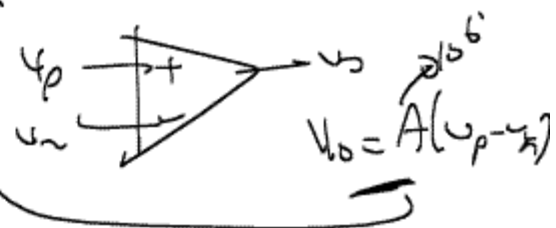


\Downarrow op-amp is in linear region.

$$v_o = A(v_p - v_n)$$

$$= 10^6 (0 - 8)$$

$$= -8 \times 10^6 < -12$$



RC/RL problems Refer to review problems online.