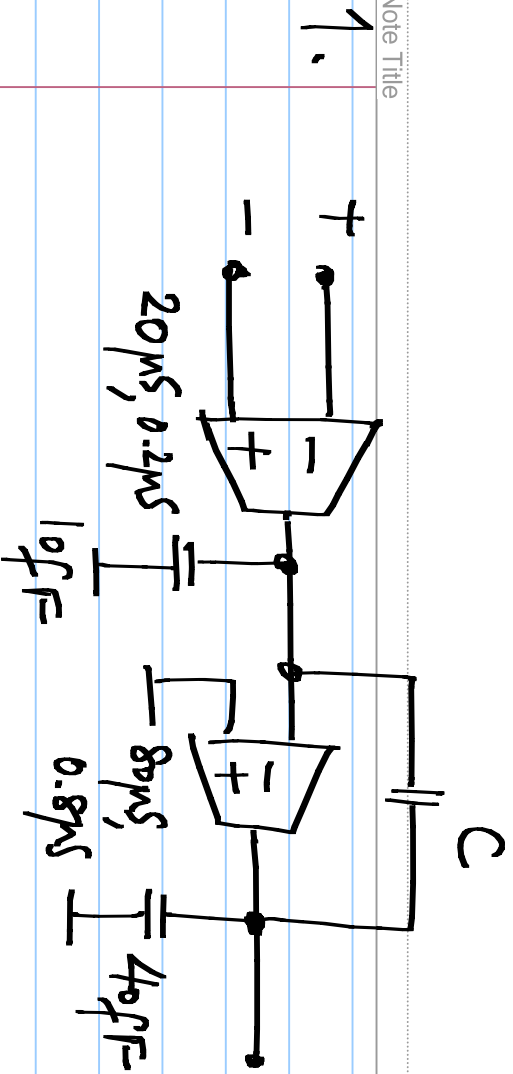


EE 3002: Analog circuits

EE 5310: Analog electronic circuits

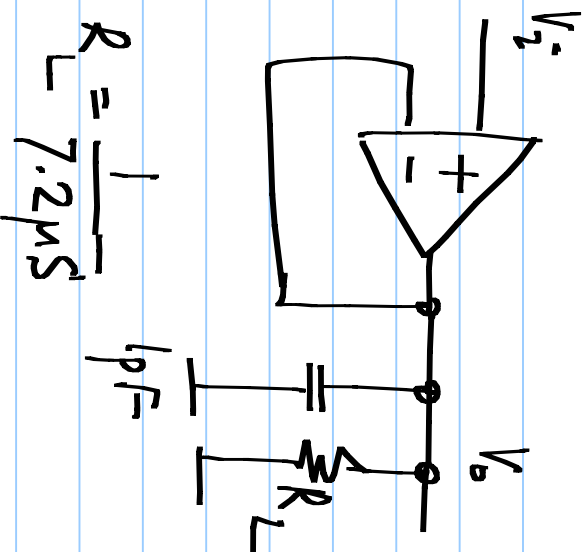
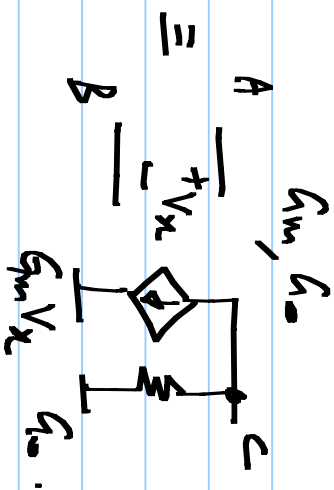
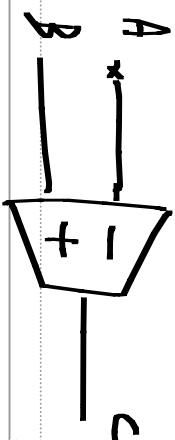
Problem set #2 (Due on 12 Sep. 2014)

problems 8 & 9 optional



TWO STAGE OPAMP

The two stage opamp above is used in the unity gain follower on the right. Determine C for 60 degree margin and the resulting bandwidth of the unity gain buffer.

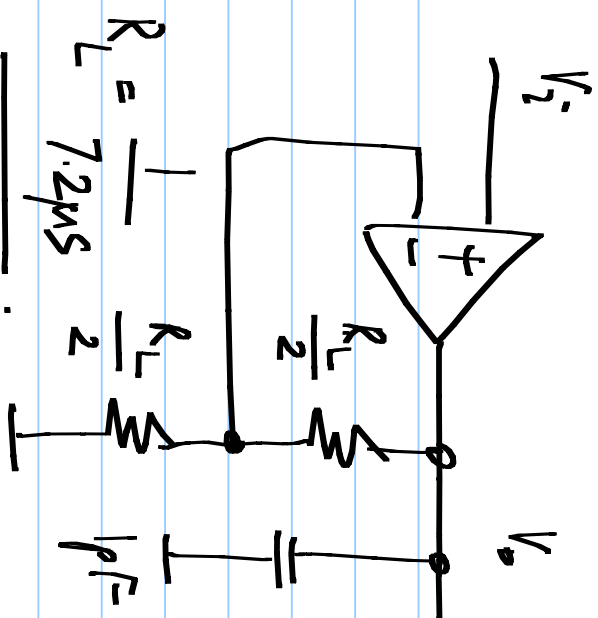


$$R = \frac{1}{7.2 \mu S}$$

$$1 pF$$

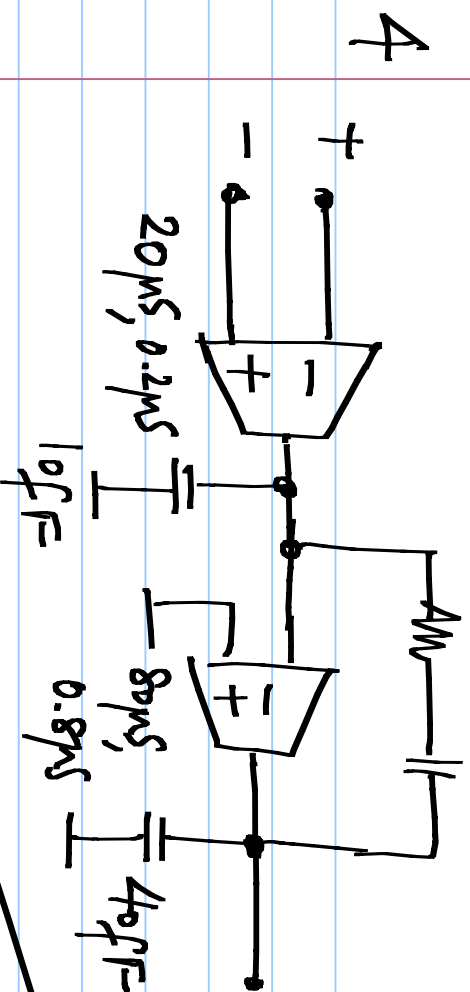
$$R_L$$

2. The two stage opamp above is used (as is) in the 2x amplifier on the right. What is the phase margin of the loop and the closed loop bandwidth of the amplifier?



3. If you are allowed to change "C" in the opamp in the above problem, what value would you use to get 60 degree phase margin? What is the bandwidth of the 2x amplifier in this case?

12.5k Ω C

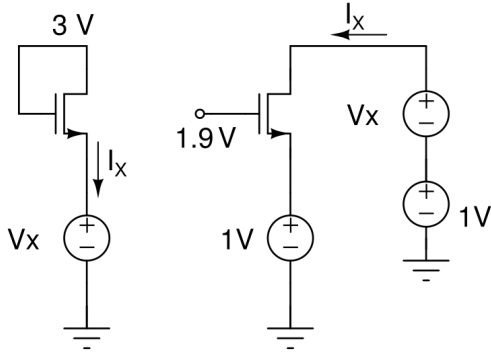


Analyze this!

A zero cancelling resistor is used in series with the integrating capacitor. Repeat prob #1 for this case.

5. Repeat prob #3 with the opamp above

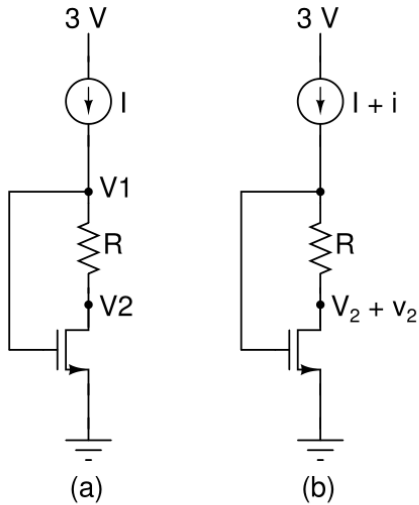
6) For each of the circuits shown below, plot I_x as V_x varies from 0-3V.



$$k = \mu_n C_{ox} = 100 \mu\text{A}/\text{V}^2, (W/L) = 10, V_T = 0.7 \text{ V}$$

Circuits for Problem 6

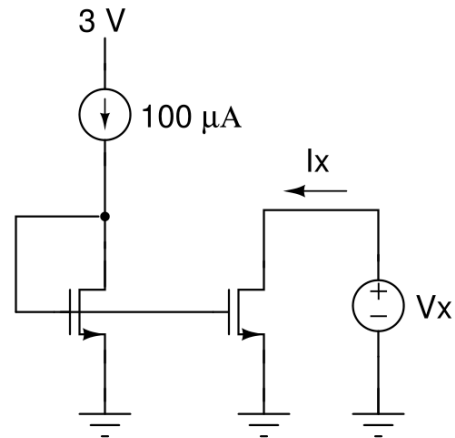
7) For the circuit (a) shown below, determine the minimum value of I required to make the MOSFET operate at the edge of the active region. In the circuit (b) shown below, determine the incremental voltage v_2 in terms of the incremental current i , assuming the device is in saturation. How will you choose R to make v_2 independent of i ?



$$k = \mu_n C_{ox} = 100 \mu\text{A}/\text{V}^2, (W/L) = 10, V_T = 0.7 \text{ V}$$

Circuit for Problem 7

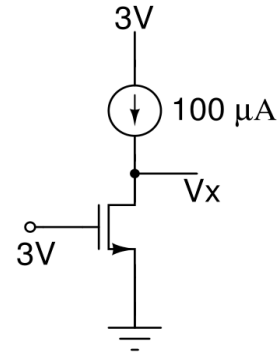
8) For the circuit shown below, sketch I_x as V_x varies in the range 0-3V.



$$k = 100 \mu\text{A}/\text{V}^2, (W/L) = 10, V_T = 0.7 \text{ V}$$

Circuit for Problem 8

9) For the circuit shown below, determine the region of operation of the transistor. Find V_x .



$$k = 100 \mu\text{A}/\text{V}^2, (W/L) = 10, V_T = 0.7 \text{ V}$$

Circuit for Problem 9