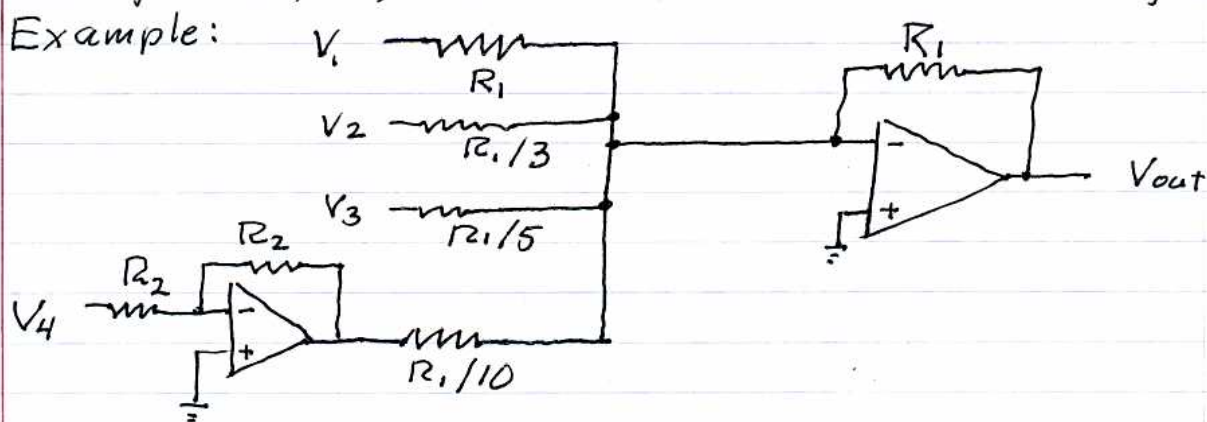
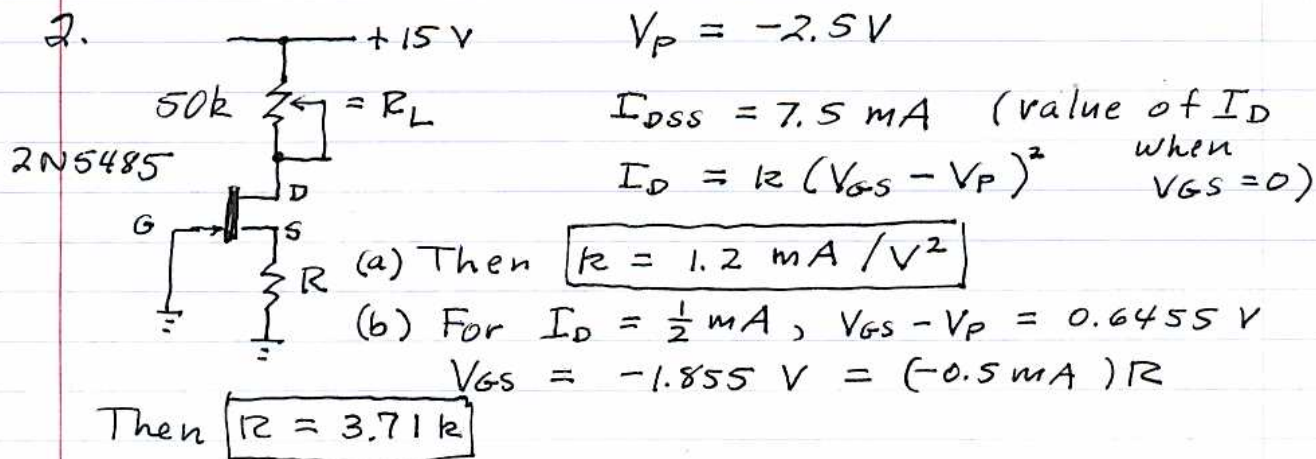


1. Design an op-amp circuit with  $V_{out} = -V_1 - 3V_2 - 5V_3 + 10V_4$

Answer: For the first 3 inputs, can use an inverting amplifier with gains  $-1, -3, -5$ . For  $V_4$ , need another inverting amp. first.



2.



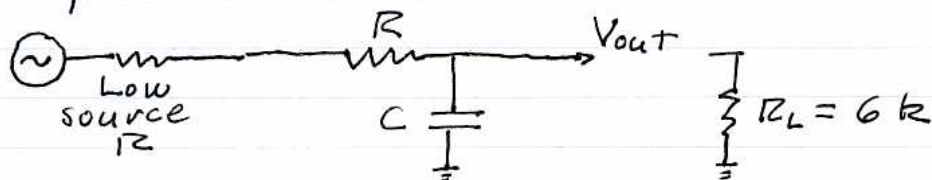
(c) Want  $V_{DS} \geq V_{GS} - V_p$  so as to be in saturation region.

$V_S = 1.855 \text{ V} \Rightarrow V_D \geq 2.5 \text{ V}$

This means the voltage drop through  $R_L$  has to be less than  $12.5 \text{ V}$ . Since the current through  $R_L$  is  $0.5 \text{ mA}$ , one has to have

$R_L < 25 \text{ k}$

3. Low-pass filter:



Far below  $f_{3dB}$ , it's as if  $C$  wasn't there, so want the circuit to act as a voltage source with  $V_{out} \geq (V_{out} [R=0])/2$ . This means one must keep  $R \leq 6 \text{ k}$  (ignoring source impedance).