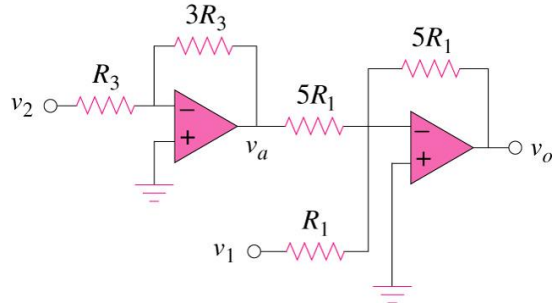


## 5. Another way to make a Difference Amp

Find the formula for  $V_o$  in the circuit below.

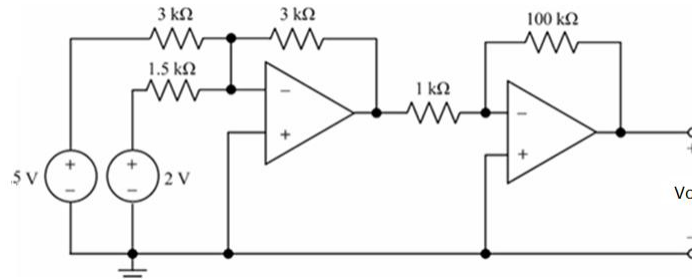


Ans:

$$v_o = -5v_1 + 3v_2$$

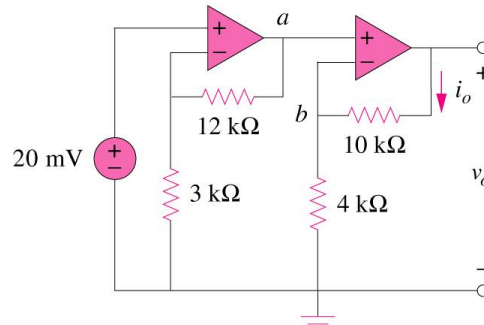
37

## 6. Find the output voltage $v_o$ [900 V]



38

7. Find  $v_o$  and  $i_o$  in the circuit shown below.



Ans: 350mV, 25 $\mu$ A 39

## How to Approach Op-Amp probs

1. Check for negative feedback  
All of our Op-Amp ccts will be "Closed Loop" with negative feedback
2. Assume current flowing into  $V_p/V_n$  terminals of op-amp = 0
3. Assume Op-Amp in linear range  
This means  $V_p$  must =  $V_n$   
otherwise  $A(V_p - V_n)$  takes us to saturation
4. Determine value of  $V_p$
5. Set  $V_n = V_p$
6. Set up nodal equation at  $V_n$  node and solve for  $V_o$
7. Check that  $V_o$  does not exceed power supply voltages  $\pm V_{cc}$  (if given)  
If so, then assumptions 3 and 5 do not hold  
Set  $V_o$  to the power supply voltage and recalculate

If you recognize common forms you can use formulas related to them

- Very helpful in cascaded Op-Amp problems
- Best not to depend too much on these
- You should always be able to go back to KCL/KVL