ECS 203 2015: Exercise 3 **Solution**

Instructions

i. Separate into groups of no more than four persons. Make sure the group members are not exactly the same as any of your earlier group.

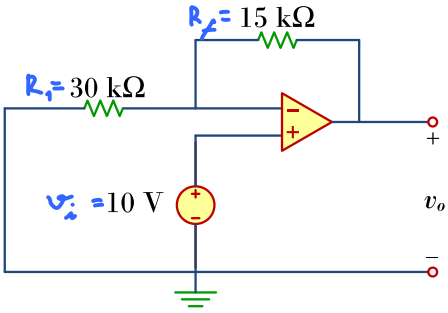
ii. Only one submission is needed for each group. Late submission will not be accepted.

iii. ***Write down all the steps*** that you have done to obtain your answers. You may not get full credit even when your answer is correct without showing how you get your answer.

iv. **Do not panic.**

Name	ID
Prapun	**555**

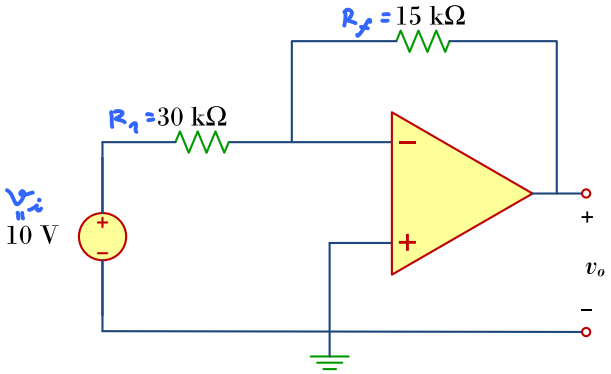
1. Find v_o in each of the circuits below.
   Hint: Compare them (possibly under some circuit simplification) with the known amplifiers discussed in class.



This is a non-inverting amp.

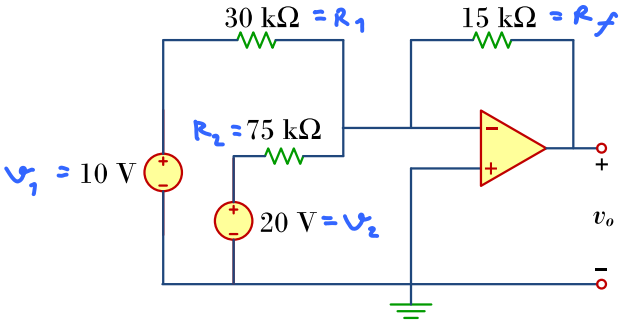
$$v_o = \left(1+\frac{R_f}{R_1}\right)v_i = \left(1+\frac{15k}{30k}\right)\times 10 = \left(1+\frac{1}{2}\right)\times 10$$

$$= \frac{3}{2}\times 10 = 15 \text{ V}$$



This is an inverting amp.

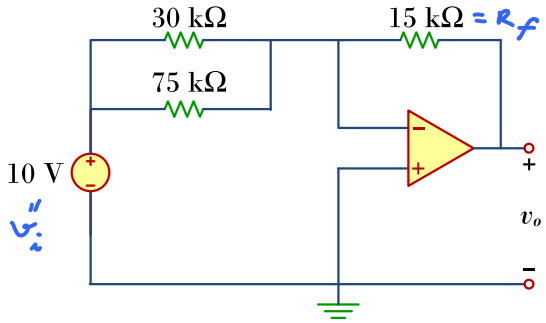
$$v_o = -\frac{R_f}{R_1}v_i = -\frac{15k}{30k}\times 10 = -5 \text{ V}$$



This is a summing amp.

$$v_o = -\sum_k \frac{R_f}{R_k}v_k = -\left(\frac{15k}{30k}\times 10 + \frac{15k}{75k}\times 20\right)$$

$$= -(5+4) = -9 \text{ V}$$



After combining the 30kΩ and the 75kΩ into $R_1 = 30k \,//\, 75k = \frac{30k\times 75k}{30k+75k} = \frac{150}{7}$ kΩ,

we have an inverting amplifier.

So, $v_o = -\frac{R_f}{R_1}v_i = -\frac{15}{150/7}\times 10 = -7$ V

Alternatively, we may look at this circuit as a summing amplifier with $v_1 = v_2 = 10$ V.

Therefore, $v_o = -\left(\frac{15k}{30k}\times 10 + \frac{15k}{75k}\times 10\right) = -7$ V (same)