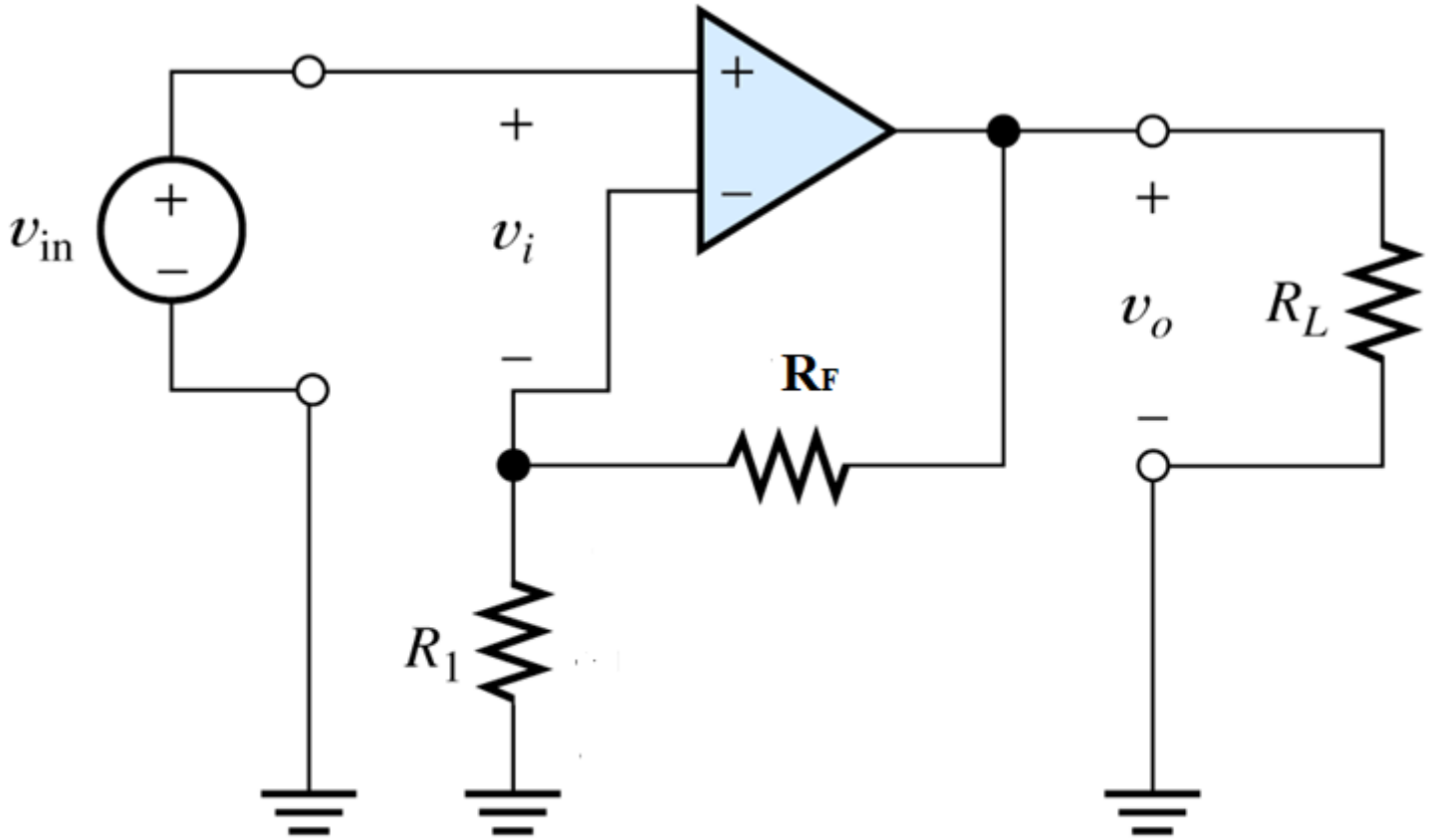
OPERATIONAL AMPLIFIER (OP-AMP)

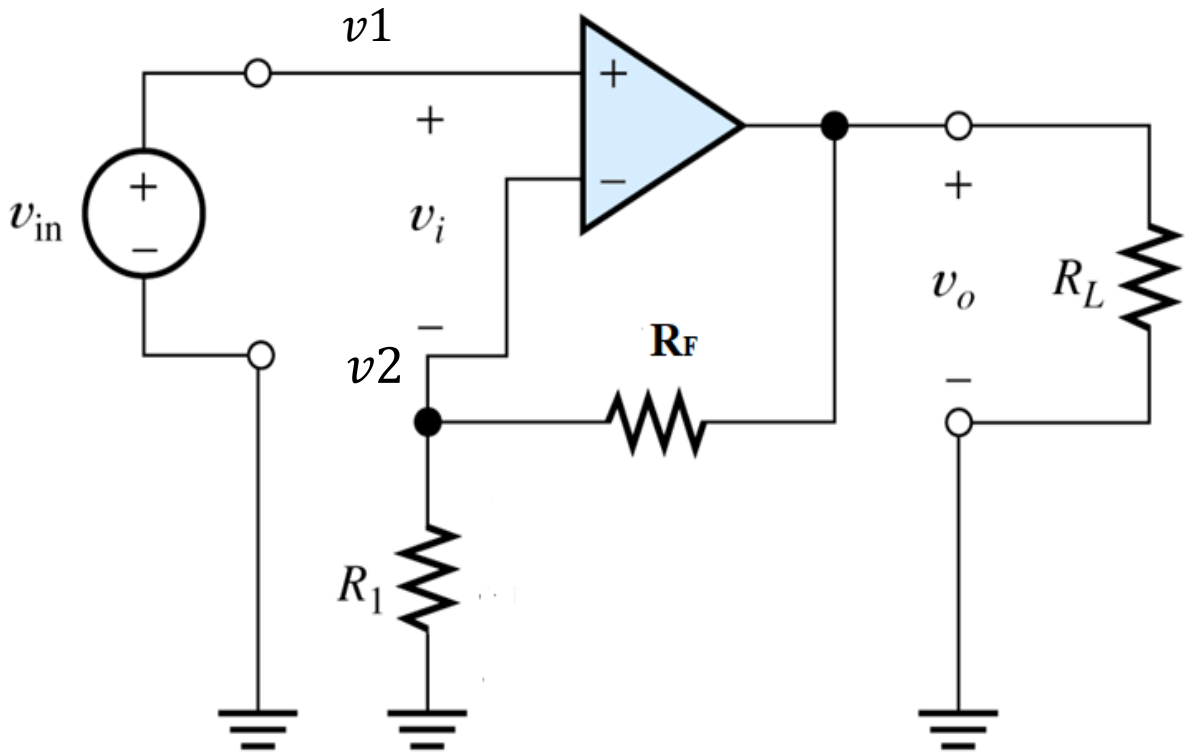
NON-INVERTING AMPLIFIER



NON-INVERTING AMPLIFIER

- Input is applied to non-inverting terminal
- Feedback is given to inverting terminal
- Output voltage will be in-phase with input voltage
- Here again, the following assumptions are made
  - Since A_d is very high, v_{id} should be very small; v_{id} taken as almost zero
  - Current entering OPAMP input terminal is almost zero

NON-INVERTING AMPLIFIER



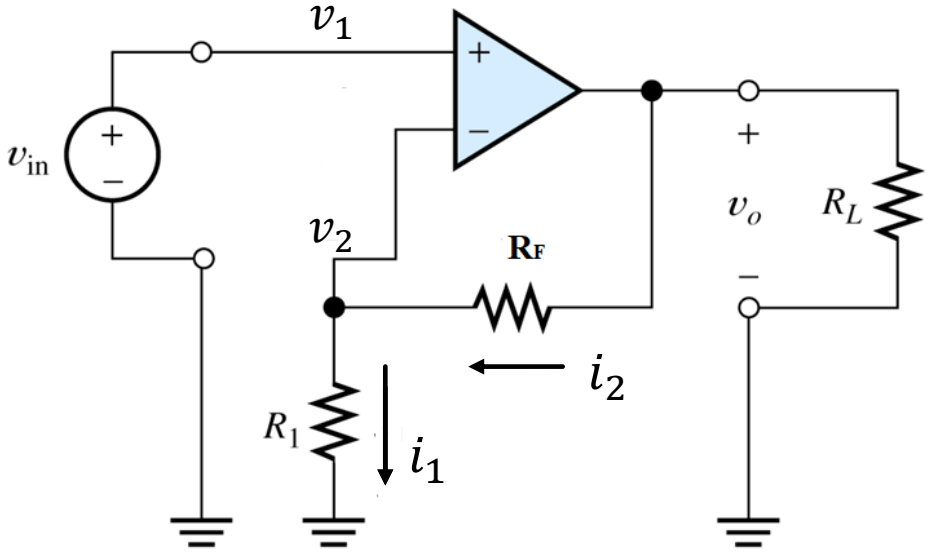
NON-INVERTING AMPLIFIER

$$v_{id} = 0 \qquad v_1 = v_2 = v_{in}$$

$$i_1 = \frac{v_2}{R_1} = \frac{v_{in}}{R_1} \qquad i_2 = \frac{v_o - v_2}{R_F} = \frac{v_o - v_{in}}{R_F}$$

$$i_1 = i_2$$

$$\frac{v_{in}}{R_1} = \frac{v_o - v_{in}}{R_F} \qquad v_o = v_{in}\left(1 + \frac{R_F}{R_1}\right)$$

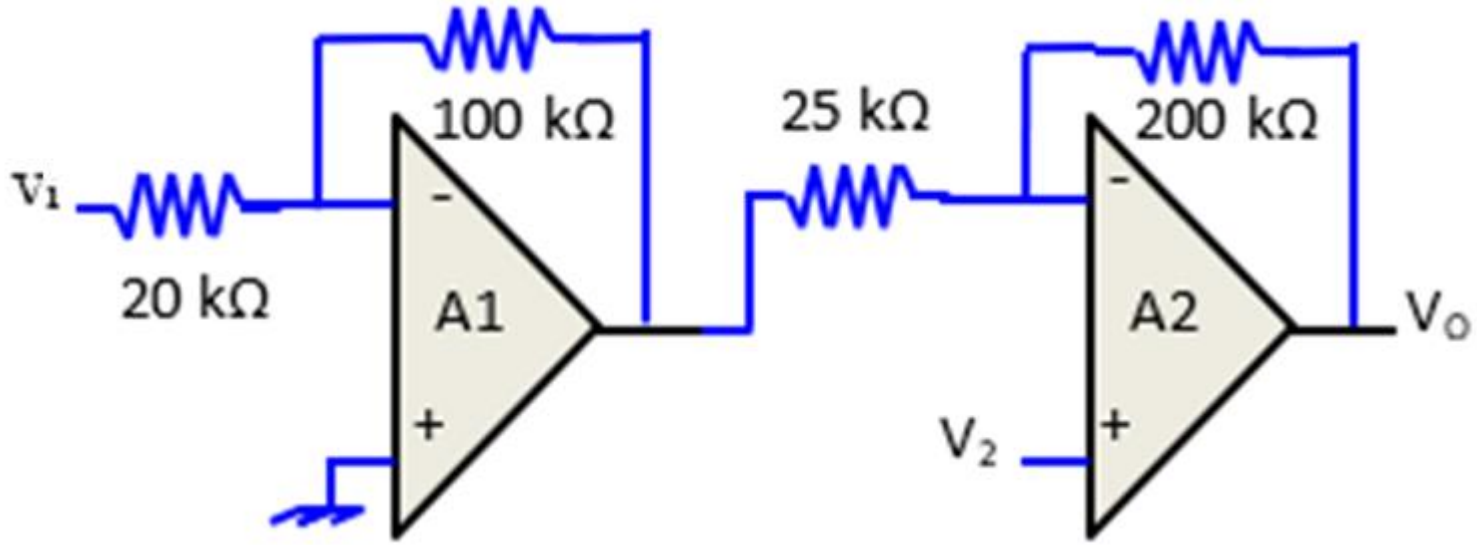


PROBLEMS

1. For an non-inverting amplifier using OPAMP, R_1=1K, R_F=100K, v_{in}=0.1sin(ωt). Find v_o.
2. For a non-inverting amplifier, R_1=10K, R_F=100K. Calculate v_o if v_i = 25 mV dc.
3. An ac signal of rms value 2 mV needs to be amplified to 1.2 V rms, and output must be in same phase as input. Design a suitable amplifier choosing R_1=2K

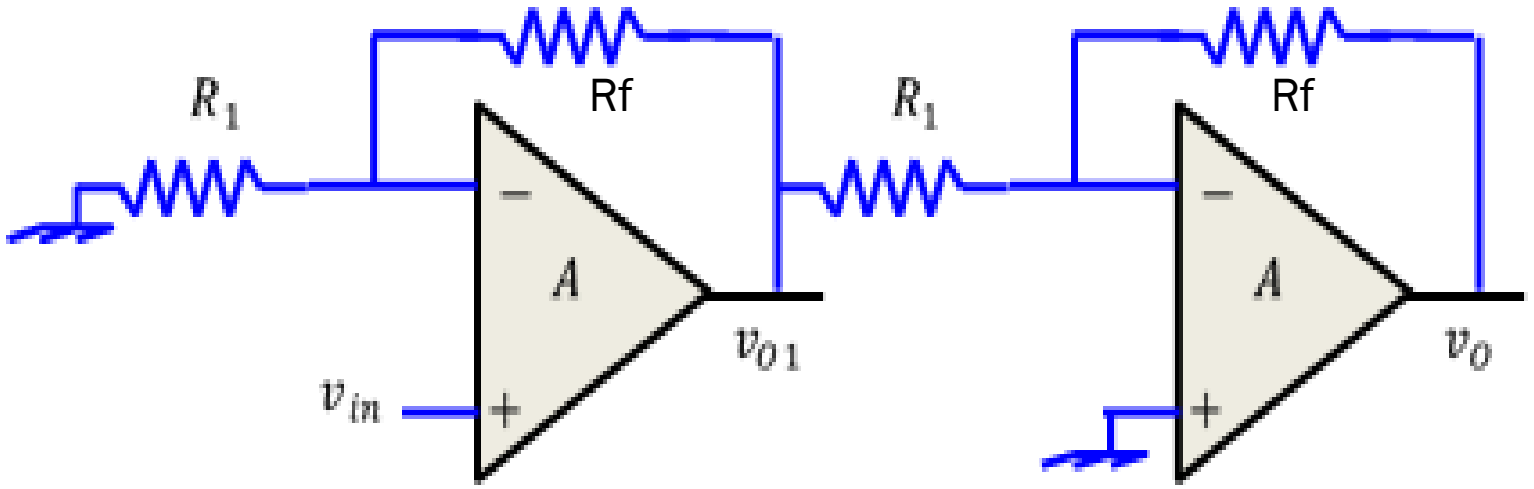
EXAMPLE 4

Fin the output voltage V0 for the following circuit if v1= 2V =V2.



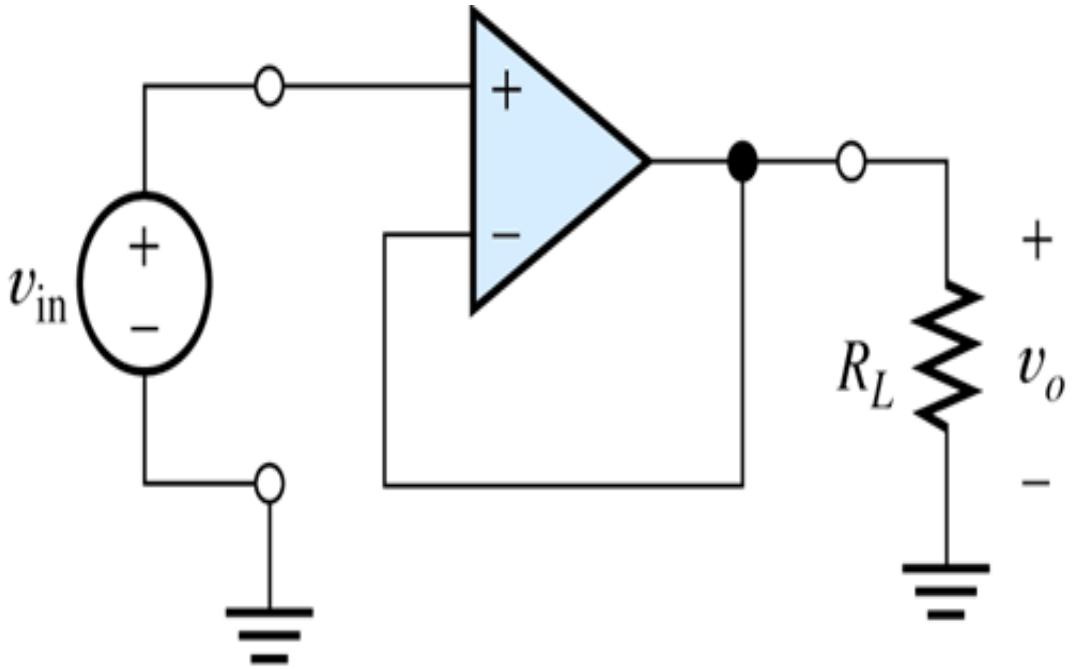
EXAMPLE 5

Fin the output voltage V0 for the following circuit if Vin= 2V , R1=2k and Rf= 10k.



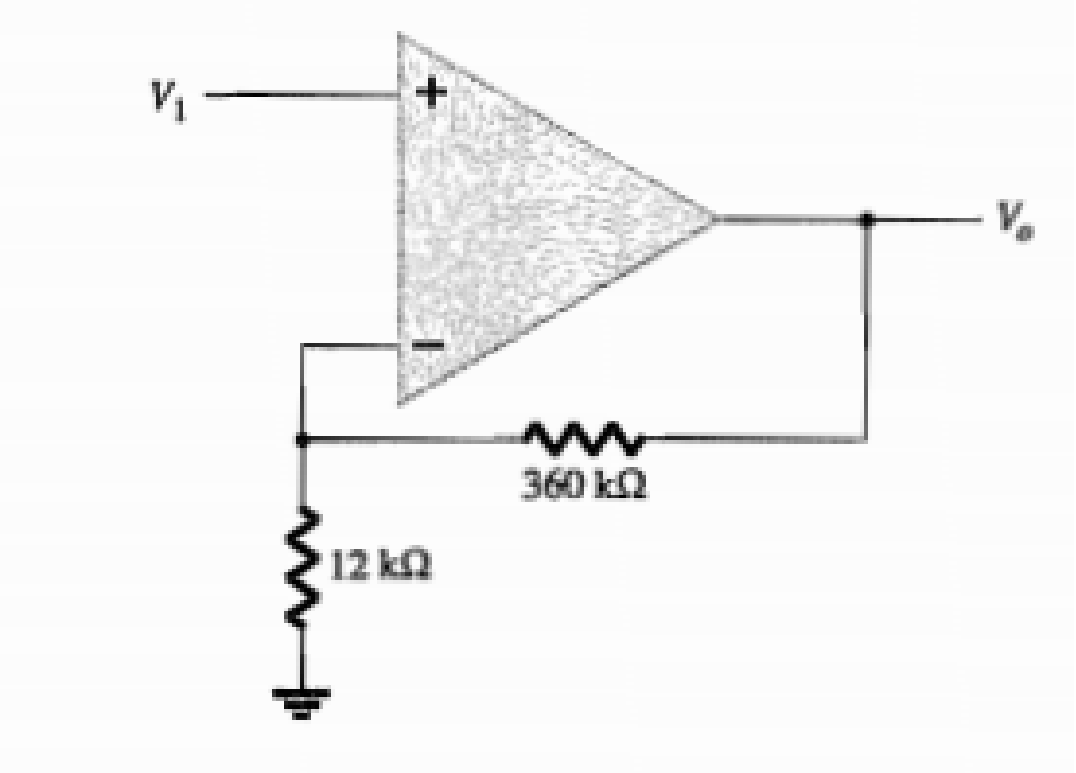
VOLTAGE FOLLOWER

- Special case of non- inverting amplifier where R_F=0
- Voltage gain is unity. $v_o = v_{in}$
- Has very high input resistance and very low output resistance; Used as buffer for impedance matching



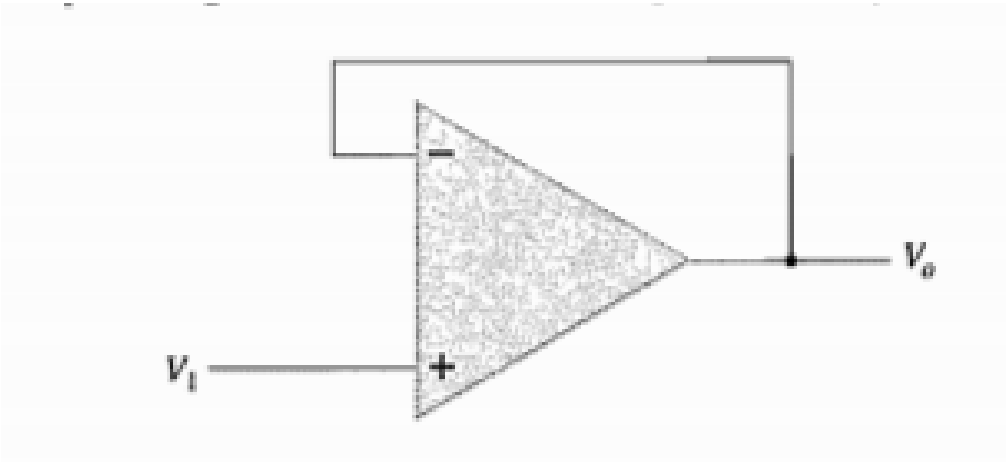
EXAMPLE 6

Fin the output voltage V0 for the following circuit if v1= 2V =V2.

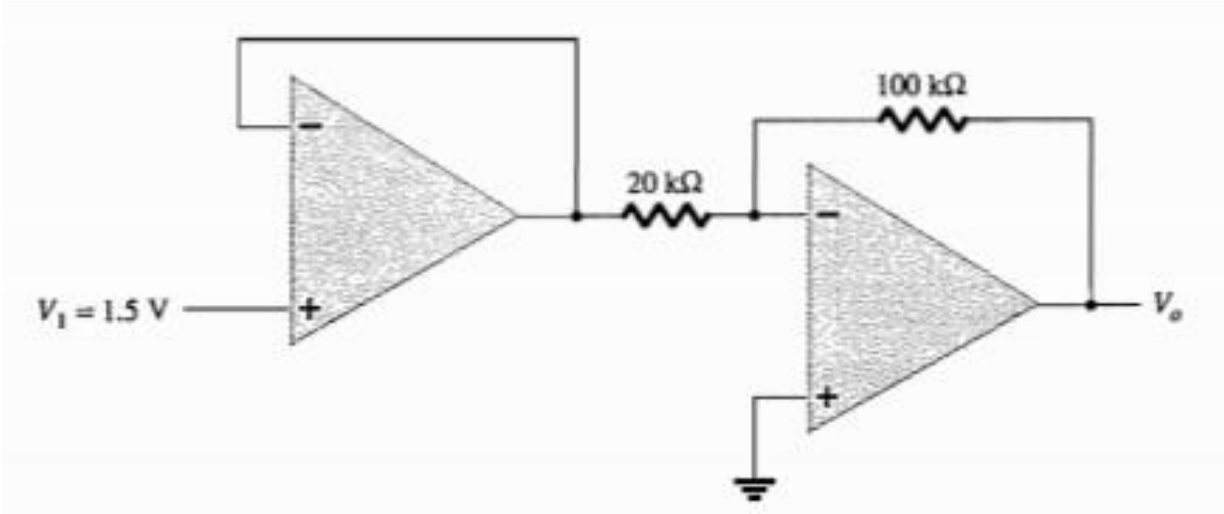


EXAMPLE 7

Fin the output voltage V0 for the following circuit if v1= 2.V.

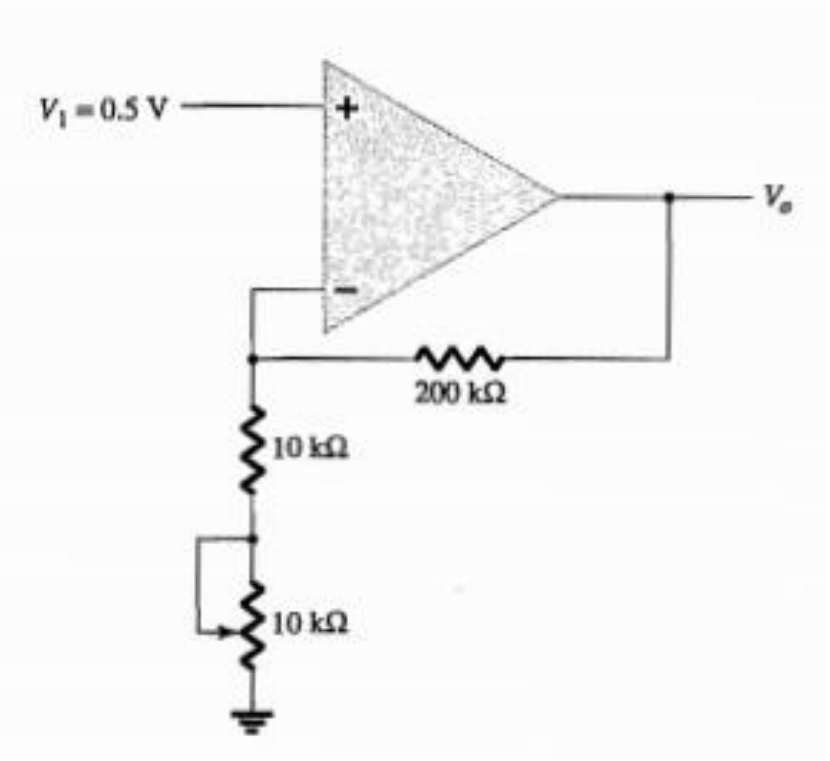


Fin the output voltage V0 for the following circuit.



EXAMPLE 8

Calculate the range of output voltage for the circuit.



Thank You