

ECE113|BASIC ELECTRONICS

Dr. S.S.Jamuar

Lab_6:

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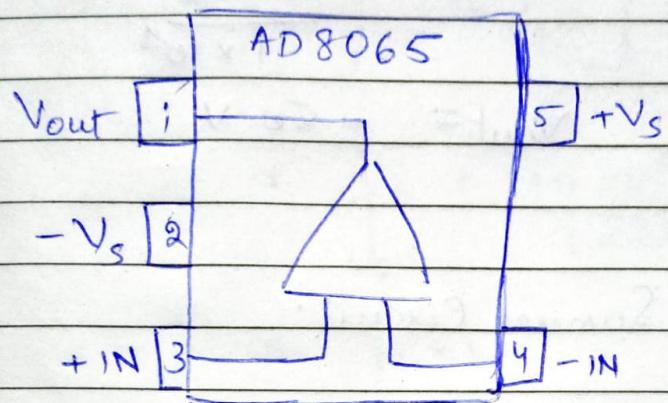
AIM 1 :Analyse the following applications of an Operational Amplifier

- 1) Inverting Amplifier**
- 2) Summer Circuit**
- 3) Non-inverting Amplifier**
- 4) Voltage follower Circuit**
- 5) Difference Amplifier**

Components Used : voltage source ,resistor , AD 8065 opamp , wires.

Software used : LTspice

Opamp(8065)



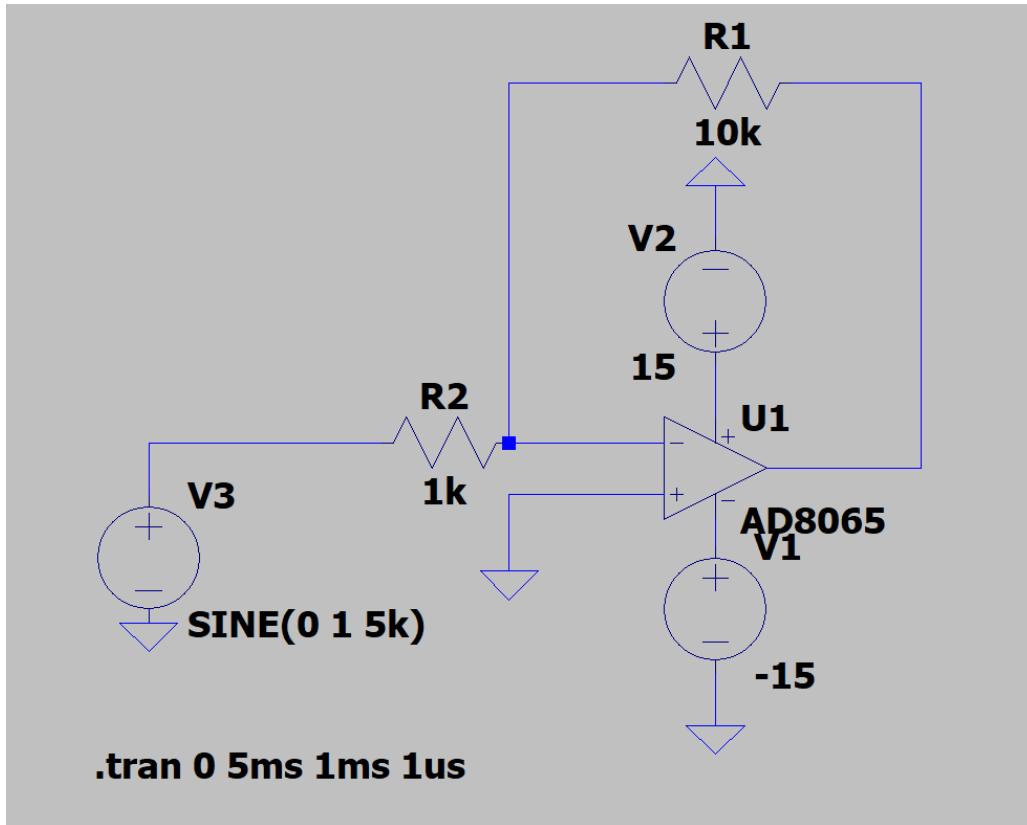
Operating voltage range \rightarrow 5 V - 24 V

Slew rate \rightarrow 180/ μ s ($a = +2$)

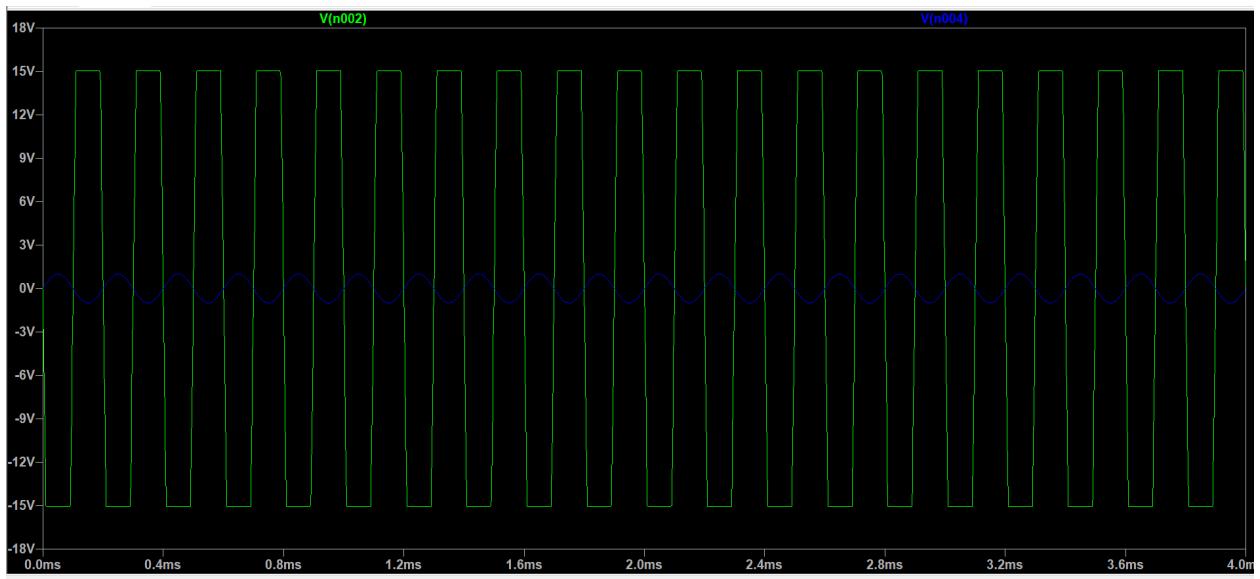
IC packaging type \rightarrow SOIC-8, SOT-23-5,
MSOP-8

Bandwidth \rightarrow 145 MHz, -3 dB

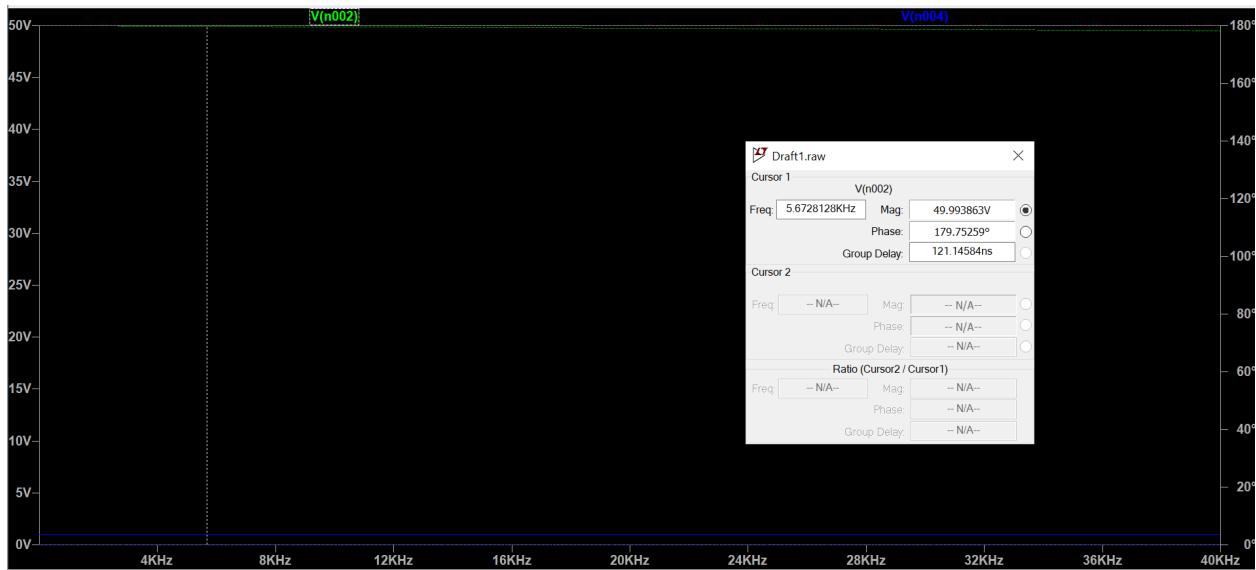
Inverting Amplifier



Transient Analysis :



AC analysis:



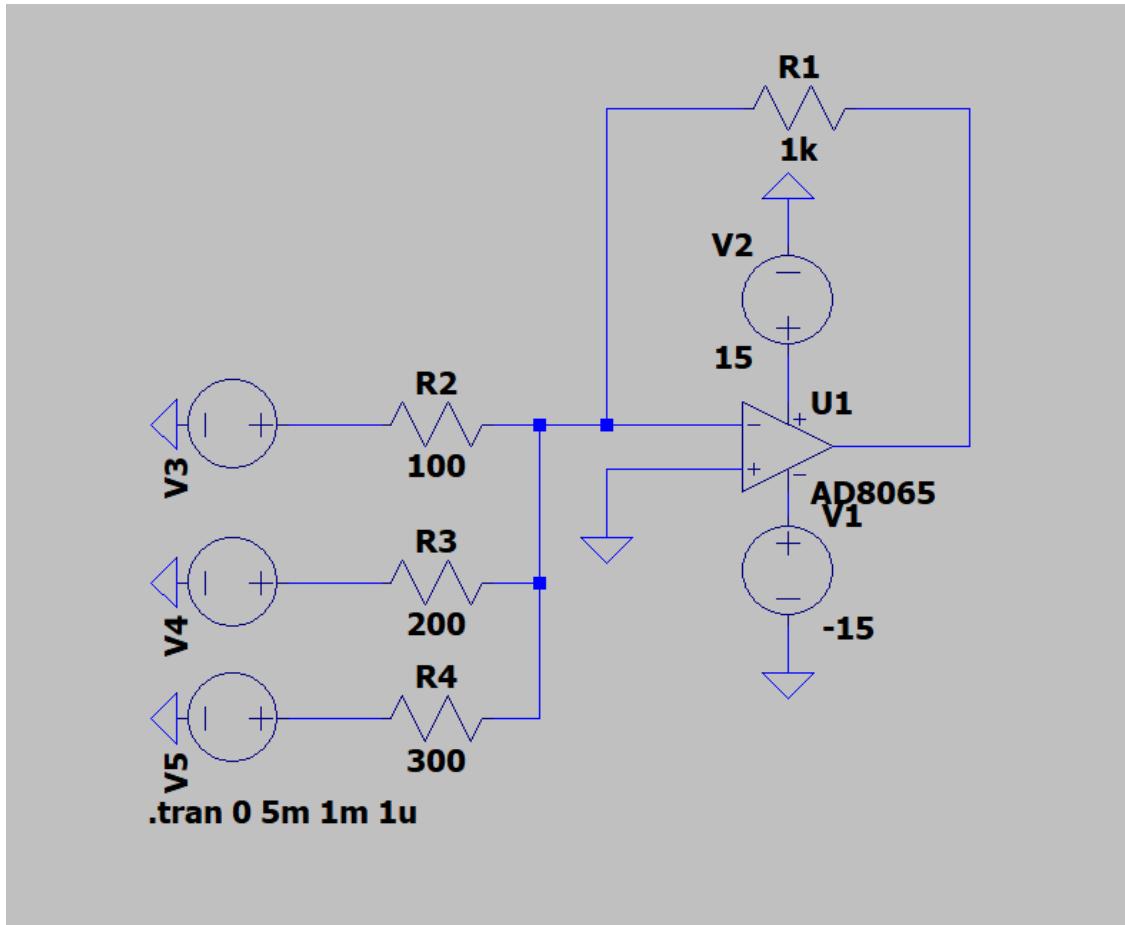
Gain = -50

Theoretical verification :

Invertig Amp.

$$V_{out} = -\frac{R_f}{R_i} \times V_{in}$$
$$= -\frac{50 \times 10^3}{1 \times 10^3} \times 1$$
$$V_{out} = -50 \text{ V}$$

Summer Circuit



Transient Analysis :



Theoretical verification :

Summer Circuit.

$$V_{out} = -R_f \left(\frac{V_1}{R_1} + \frac{V_2}{R_2} + \frac{V_3}{R_3} \right)$$

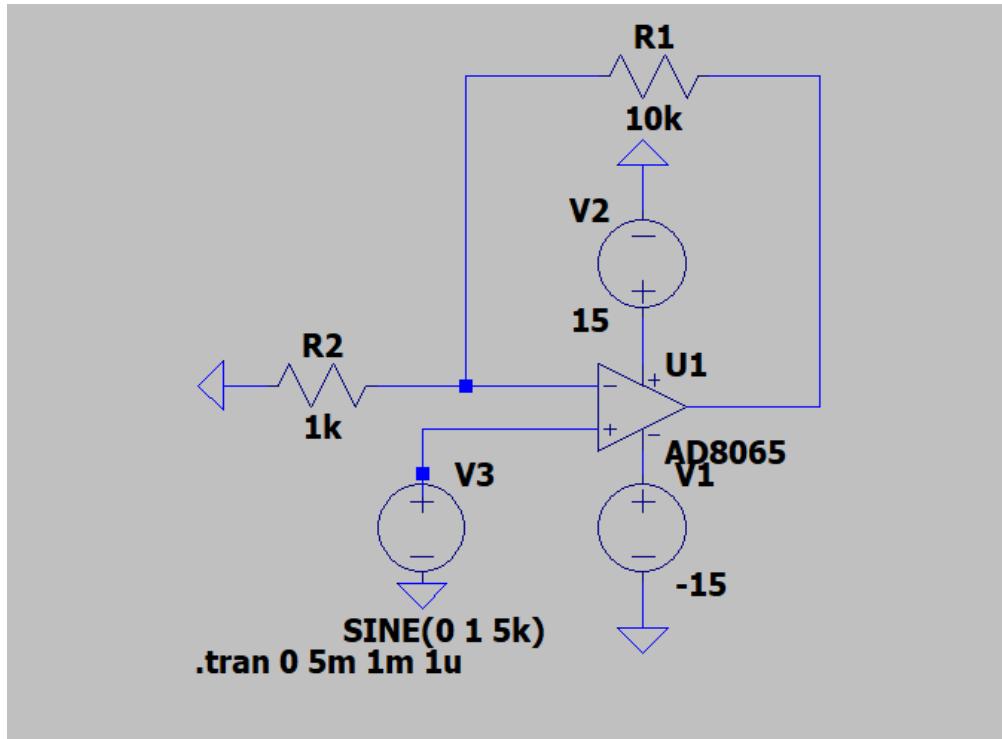
$$= -10^3 \left(\frac{10^{-3}}{100} + \frac{8 \times 10^{-3}}{200} + \frac{8 \times 10^{-3}}{300} \right)$$

$$= -10 \left(3 \times 10^{-3} \right)$$

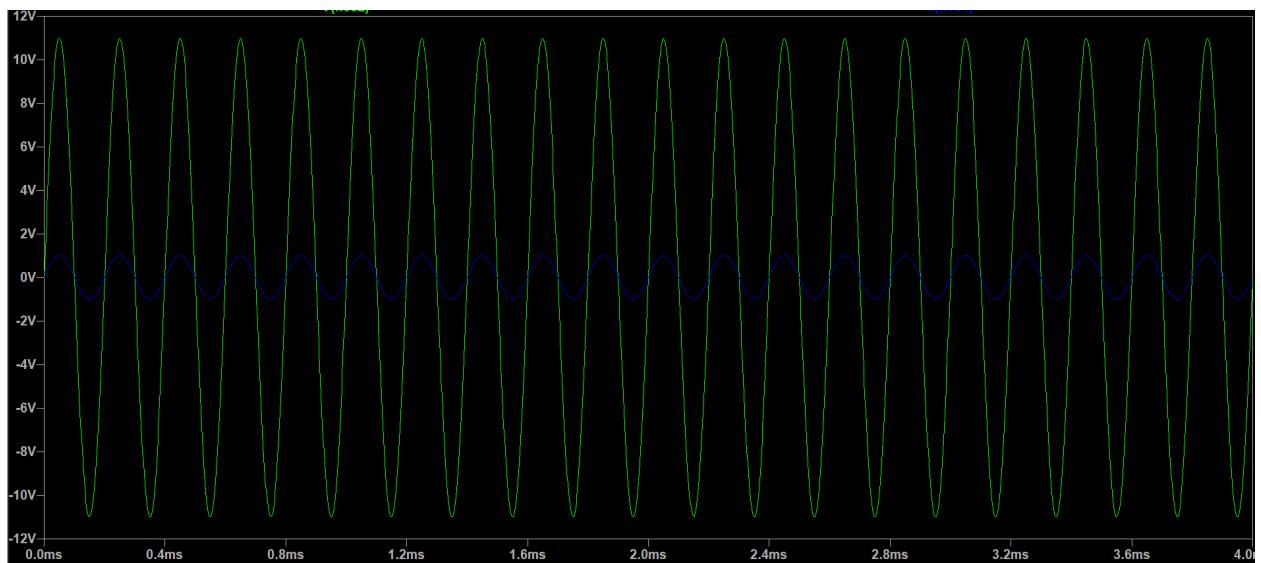
$$= \text{---} - 3 \times 10^{-2}$$

$$= -30 \text{ mV.}$$

Non-inverting Amplifier



Transient Analysis :



Theoretical verification :

Non inverting Amp.

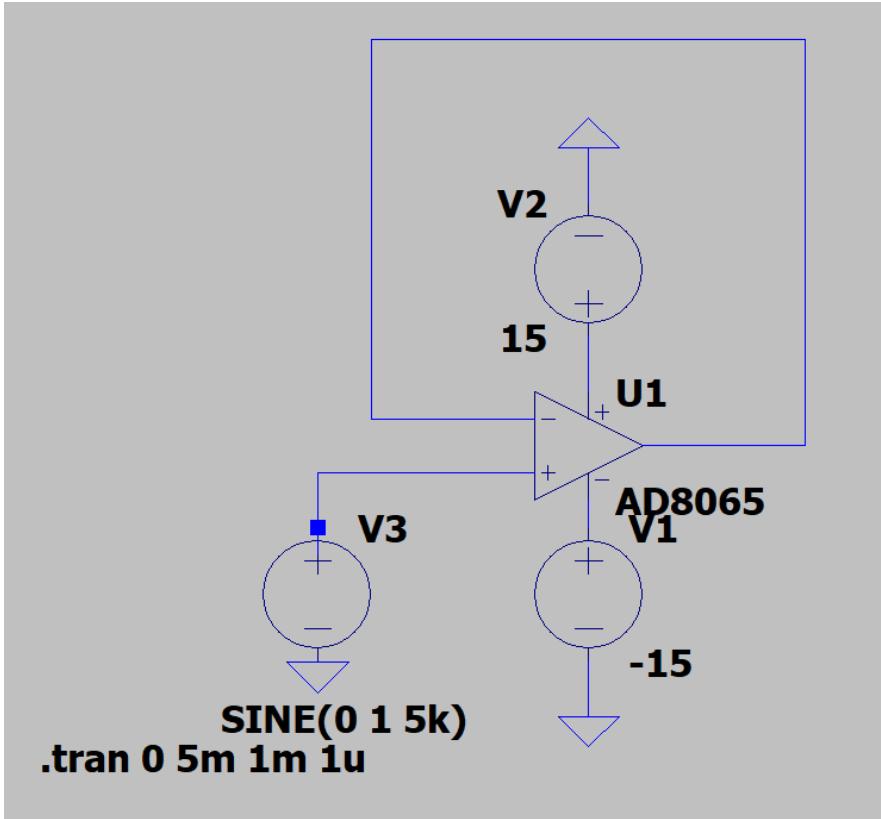
$$V_{out} = \left[1 + \frac{R_F}{R_{in}} \right] V_{in}$$

$$= \left[1 + \frac{10 \times 10^3}{1 \times 10^2} \right] 1$$

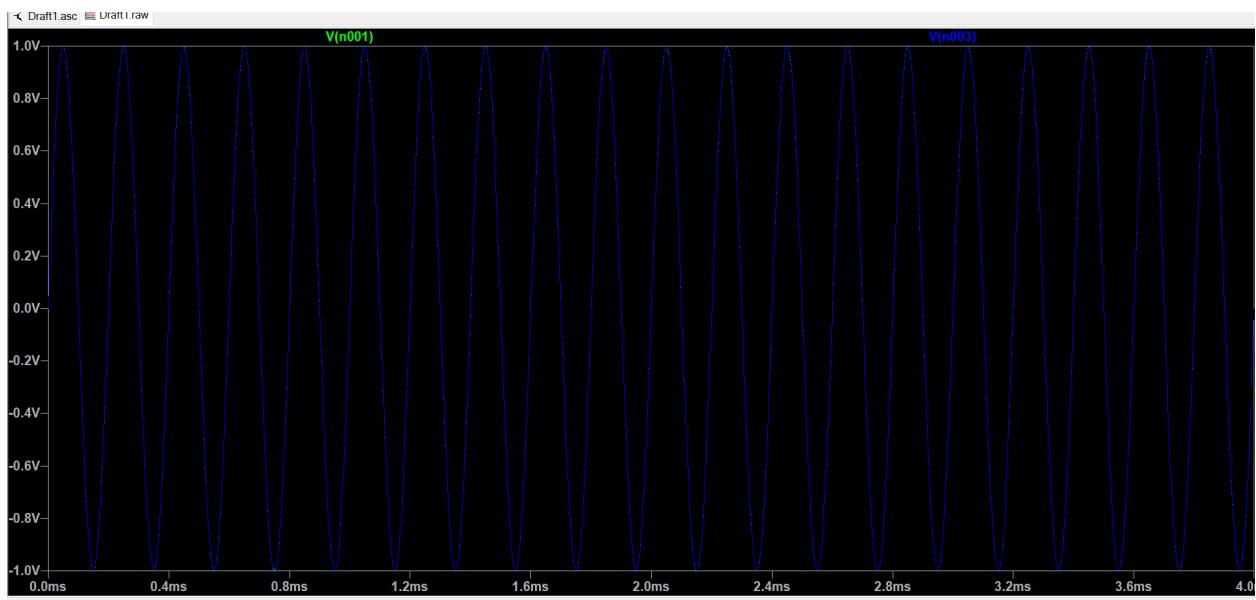
$$= 11 \times 1$$

$$V_{out} = 11V$$

Voltage follower Circuit



Transient Analysis :



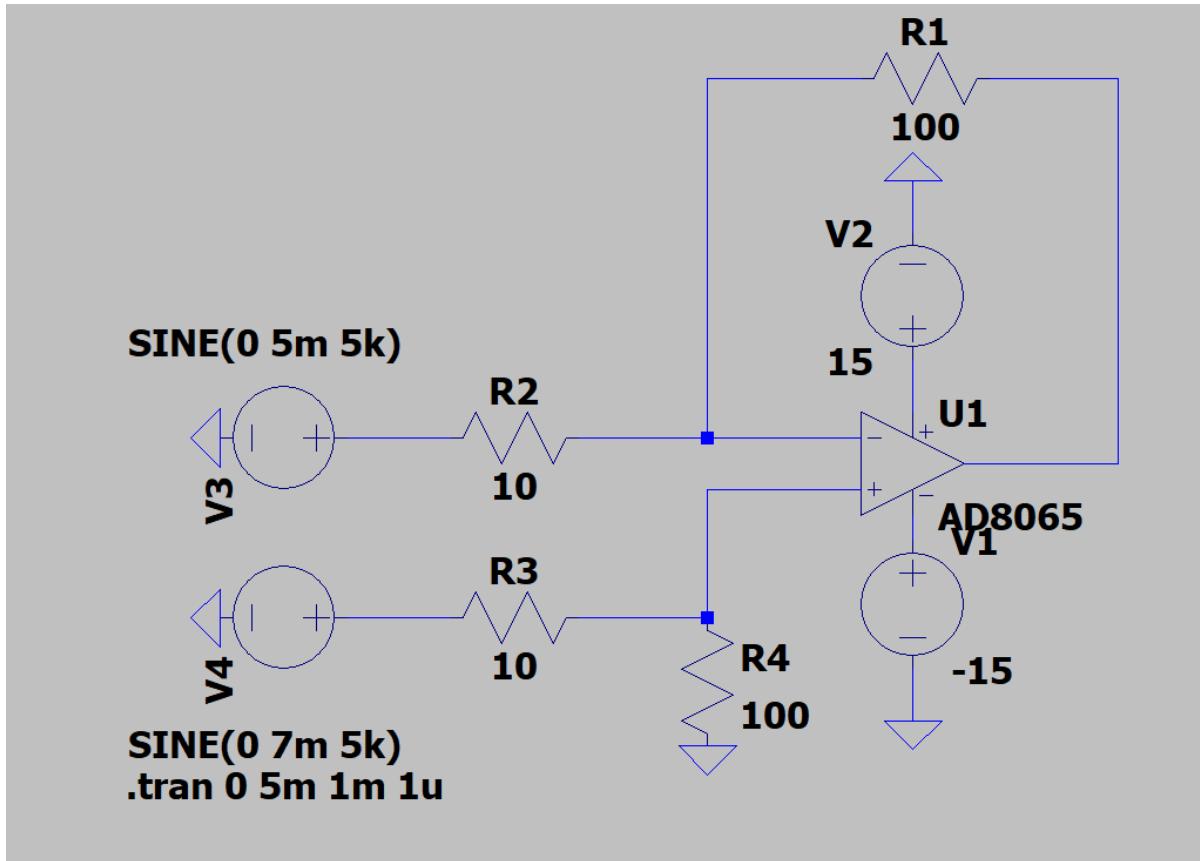
They are overlapping

Theoretical verification :

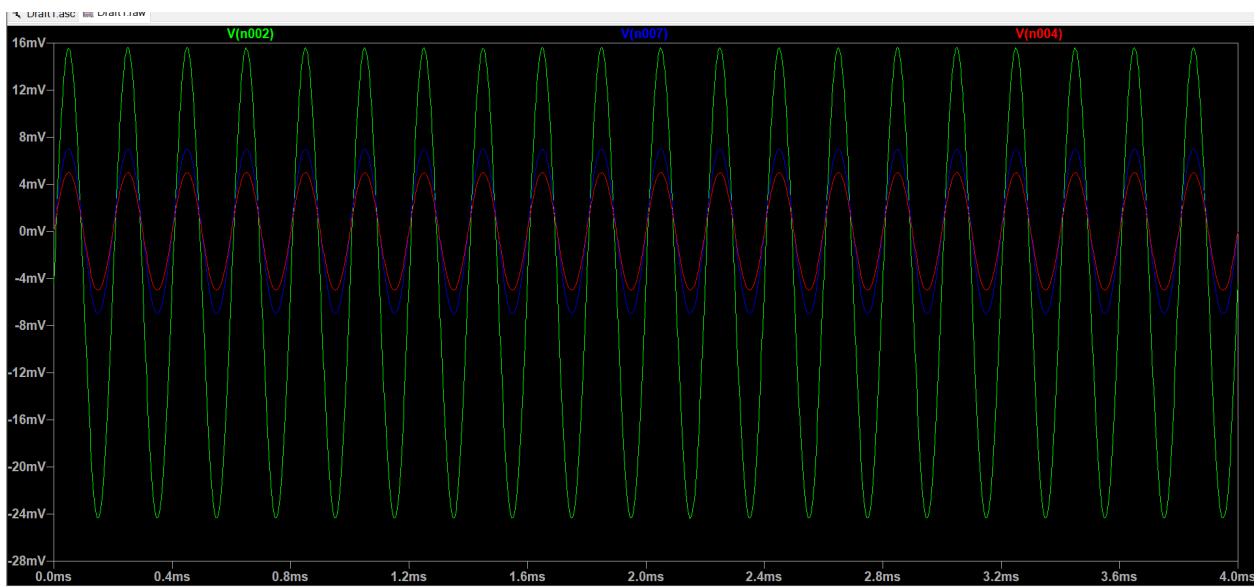
Voltage follower circuit.

$$\begin{aligned}V_{out} &= V_{in} \\&= 1V.\end{aligned}$$

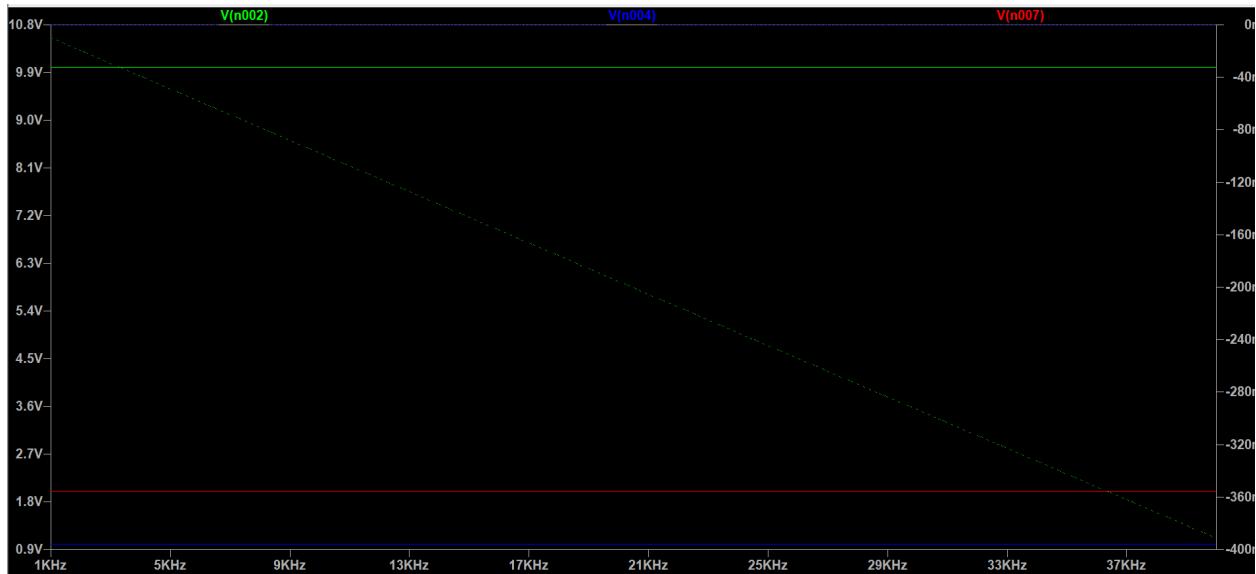
Inverting Amplifier



Transient Analysis :

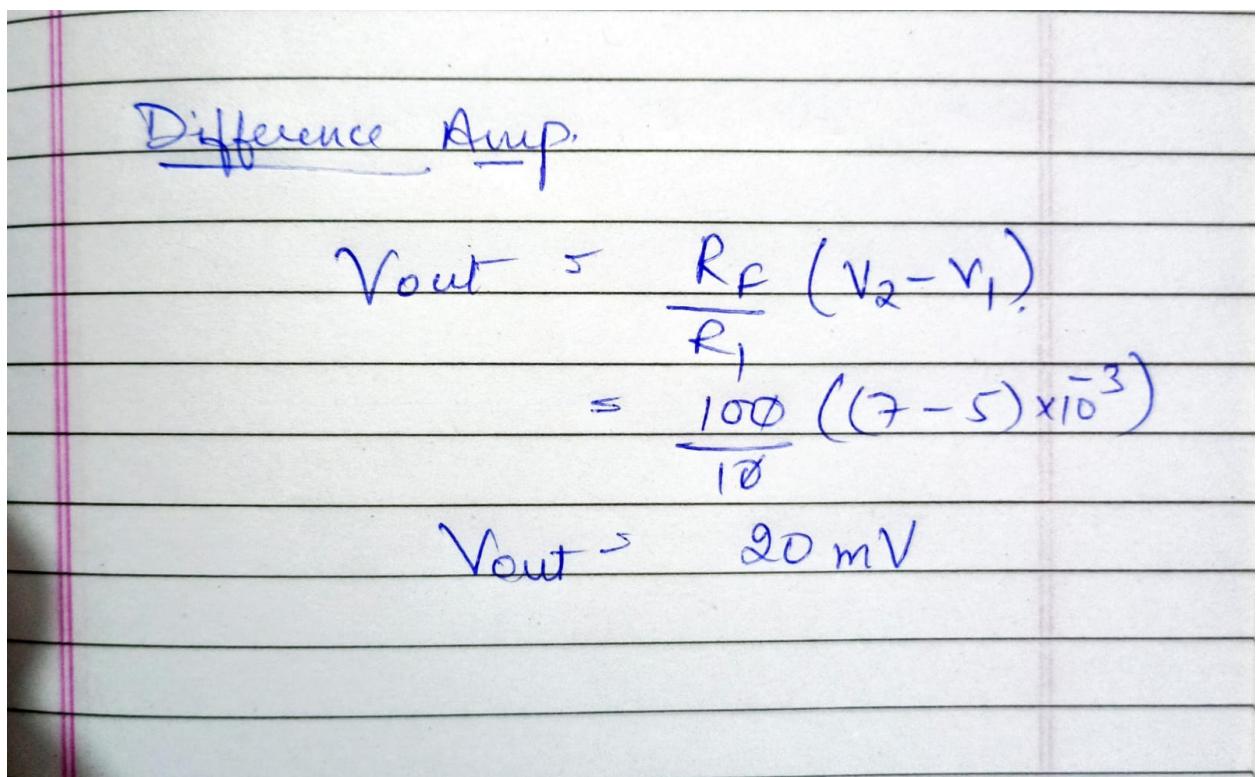


AC analysis:



Gain = 10

Theoretical verification :



Observations:

- 1) In inverting amplifier the Vout is limited from -15 to 15V because of the source voltage instead of 50V
- 2) Voltage shifts from (-30 to 30 mv) to (-36 to 24 mv) in the summer circuit, similarly in difference amplifier.
- 3)

Amplifier	Vout
Inverting Amplifier	50v
Summer Circuit	-30mv
Non-inverting Amplifier	11v
Voltage follower Circuit	1v
Difference Amplifier	20mv

Applications :

- 1) Inverting Amplifier
 - 2) Summer Circuit
 - 3) Non-inverting Amplifier
 - 4) Voltage follower Circuit
 - 5) Difference Amplifier
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