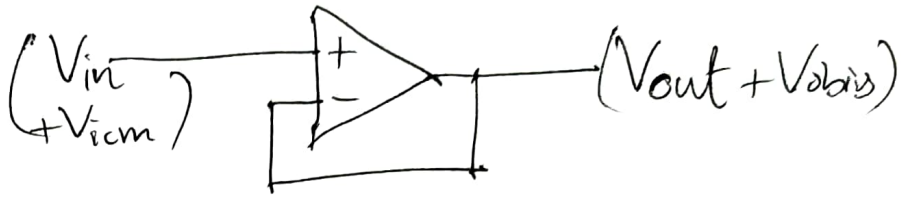
Maximum Swing

Swing limits $\begin{cases} V_i \in [1.5V, 4.5V] \\ V_o \in [0.5V, 4.5V] \end{cases}$

* Voltage Follower:

$V_{icm} = V_{obias}$

$V_{out} = \frac{A_d}{1+A_d} \times V_i \approx V_{in}$



$1.5 \le V_{icm} + V_{in} \le 4.5$ & $0.5 \le \underbrace{V_{icm} + V_{in}}_{(V_{obias} + V_o)} \le 4.5$

$\Rightarrow V_{icm} = 3V$ & $V_{in} = 1.5V$ (Assuming sine wave input)

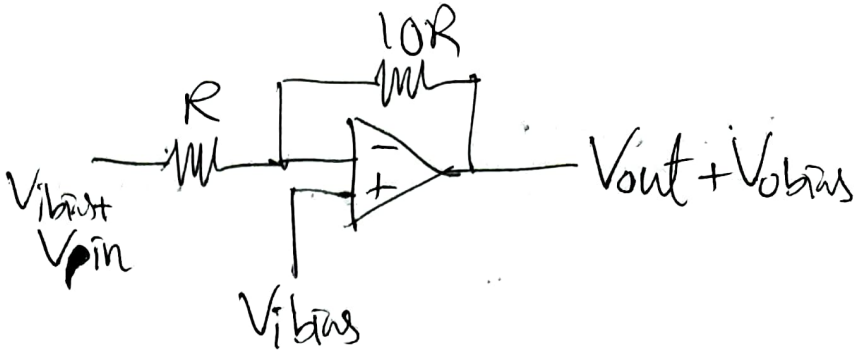
* Inverting amplifier : (say with a gain of -10)

$V_{ibias} = V_{obias}$

$V_{out} \approx -10\, V_{in}$

$1.5 \le V_{ibias} + V_{in} \le 9.5$

&



$0.5 \le V_{obias} + V_{out} \le 9.5$

$\Downarrow$

$0.5 - V_{obias} \le V_{out} \le 9.5 - V_{ibias}$

$\Rightarrow \frac{-(4.5 - V_{ibias})}{10} \le V_{in} \le \frac{(0.5 - V_{ibias})}{10}$

$\Rightarrow V_{ibias} = 2.5V$ & $V_{in} = 0.2V$ (for sine input)