Lab 3 Pre Lab

- Step 1. $V_{P1} = V_{N1}$ $\quad i_b = \dfrac{V_{N1} - V_{out}}{R_b}$

$$i_a = \frac{-V_{N1}}{R_A}$$

@ Node V_{N1} : $i_a = i_b$

$$\frac{-V_{N1}}{R_A} = \frac{V_{N1} - V_{out}}{R_b} = \frac{V_{N1}}{R_b} - \frac{V_{out}}{R_b}$$

$$\frac{(R_b)(-V_{N1})}{R_A} = V_{N1} - V_{out} \qquad V_{N1} = V_{S1}$$

$$\frac{(R_b)(-V_{N1})}{R_A} - V_{N1} = -V_{out}$$

$$\boxed{\frac{R_b}{R_A} + 1 = \frac{V_{out}}{V_{N1}} = A_{V_1}}$$

if we want A_{V_1} to $= 3 \frac{V}{V}$ and use $10K\Omega$ for R_A then

$$\frac{R_b}{10K\Omega} + 1 = 3 \Rightarrow \frac{R_b}{10k} = 2$$

$$R_b = 20k$$

- Step 2. infinite input impedance (or zero input current)

$$R_{in} = \frac{V_{S1}}{R_{S1}}, \quad \infty = \frac{V_{S1}}{R_{S1} \to 0}$$

$V_{out} > V_{N1}$ so current flows left. Drop across R_A is V_{N1}

$$\boxed{V_{N1} = V_{out}\left(\frac{R_A}{R_A + R_B}\right)}$$