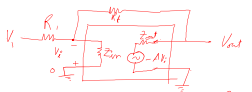
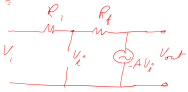


$Z_{in} \to \infty$

$Z_{out} \to 0$



$$V_{i,1} = \left(\frac{V_1}{R_1 + R_f}\right) R_f \quad ; \quad -AV_i \times$$

$$V_{i,2} = \left(\frac{-AV_i}{R_1 + R_f}\right) R_1 \quad ; \quad V_1 \times$$

$$V_i = V_{i,1} + V_{i,2} = V_1 \frac{R_f}{R_1 + R_f} - \frac{AV_i \cdot R_1}{R_1 + R_f}$$

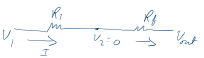
$$\left(1 + \frac{A R_1}{R_1 + R_f}\right) V_i = V_1 \frac{R_f}{R_1 + R_f}$$

$$V_i = \frac{V_1 R_f}{R_f + (1 + A) R_1} = \frac{-V_{out}}{A}$$

$$\frac{V_{out}}{V_1} = \frac{-A R_f}{R_f + (1 + A) R_1} \approx \frac{-R_f}{R_1}$$

$A \gg 1$

$A \to A R_1$



$$\frac{V_1}{R_1} = \frac{-V_{out}}{R_f}$$

$$\frac{V_{out}}{V_1} = -\frac{R_f}{R_1}$$

$$\frac{V_{out}}{V_{in}} = 1 + \frac{R_f}{R_1}$$

$$\frac{-V_{in}}{R_1} = \frac{V_{in} - V_{out}}{R_f}$$

$V_A = V_B$

$$V_{out1} = -\frac{R_2}{R_1} V_1$$

$$V_{out2} = V_B \left(1 + \frac{R_2}{R_1}\right)$$

$$V_B = \left(\frac{V_2}{R_3 + R_4}\right) R_4$$

$$\Rightarrow V_{out2} = \left(\frac{R_1 + R_2}{R_3 + R_4}\right) \frac{R_4}{R_1} V_2$$

$$V_{out} = V_{out1} + V_{out2} = -\frac{R_2}{R_1} V_1 + \left(\frac{R_1 + R_2}{R_3 + R_4}\right) \frac{R_4}{R_1} V_2$$