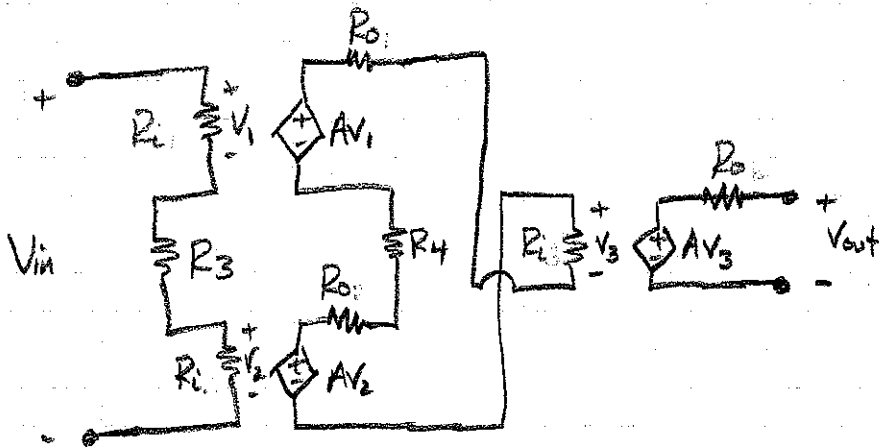


(a) Redraw circuit w/ dependent sources



$$V_{out} = AV_3 \quad (1)$$

$$V_3 = -\frac{(AV_1 + AV_2)}{2R_0 + R_4 + R_i} \cdot R_i$$

$$V_1 = V_2 = \frac{V_{in} \cdot R_i}{2R_i + R_3} \quad (2)$$

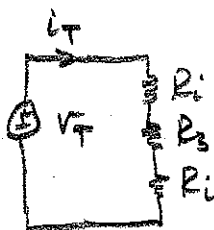
$$\text{Since } V_1 = V_2, \quad V_3 = \frac{-2AV_1}{2R_0 + R_4 + R_i} \cdot R_i \quad (3)$$

use (1), (2) and (3):

$$V_{out} = A \cdot \left[ \frac{-2AR_i}{2R_0 + R_4 + R_i} \right] \left[ \frac{V_{in} \cdot R_i}{2R_i + R_3} \right]$$

$$\frac{V_{out}}{V_{in}} = \frac{-2A^2 R_i^2}{(2R_0 + R_4 + R_i)(2R_i + R_3)}$$

(b)



$$I_T = \frac{V_T}{2R_i + R_3}$$

$$R_{in} = \frac{V_T}{I_T} = 2R_i + R_3$$

(c)

$$R_{out} = R_0$$