



$$I \text{ through Resistors} = \frac{V_o}{R_1 + R_2}$$

$$V_x = \left( \frac{V_o}{R_1 + R_2} \right) R_1$$

$$I_o = \left( \frac{V_o}{R_1 + R_2} \right) + g_m \left( \frac{V_o R_1}{R_1 + R_2} \right)$$

$$V_o = I_o (R_1 + R_2)$$

$$\frac{V_o}{I_o} = R'_{eq} = \frac{I_o (R_1 + R_2)}{\left( \frac{V_o}{R_1 + R_2} \right) + g_m \left( \frac{V_o R_1}{R_1 + R_2} \right)}$$

$$R'_{eq} = \frac{V_o}{I_o} = \frac{V_o}{\left( \frac{V_o}{R_1 + R_2} \right) + g_m \left( \frac{V_o R_1}{R_1 + R_2} \right)}$$

$$= \frac{1}{\left( \frac{1}{R_1 + R_2} \right) + \frac{g_m R_1}{R_1 + R_2}}$$

$$= \frac{1}{\frac{g_m R_1 + 1}{R_1 + R_2}}$$

$$= \frac{R_1 + R_2}{g_m R_1 + 1}$$