

$$\frac{e}{R_1} = \frac{e_{IN} - e}{R_2} + C_1 s [(1-k)e_{IN} - e]$$

$$e \left[\frac{1}{R_1} + \frac{1}{R_2} + C_1 s \right] = e_{IN} \left[\frac{1}{R_2} + (1-k)C_1 s \right]$$

$$e = \frac{\frac{1}{R_2} + (1-k)C_1 s}{\frac{1}{R_1} + \frac{1}{R_2} + C_1 s} e_{IN}$$

$$e = \frac{1 + (1-k)R_2 C_1 s}{1 + \frac{R_2}{R_1} + R_2 C_1 s} e_{IN}$$

$$i_{IN} = \frac{e_{IN} - e}{R_2} = \frac{e_{IN}}{R_2} \left[1 - \frac{1 + (1-k)R_2 C_1 s}{1 + \frac{R_2}{R_1} + R_2 C_1 s} \right]$$

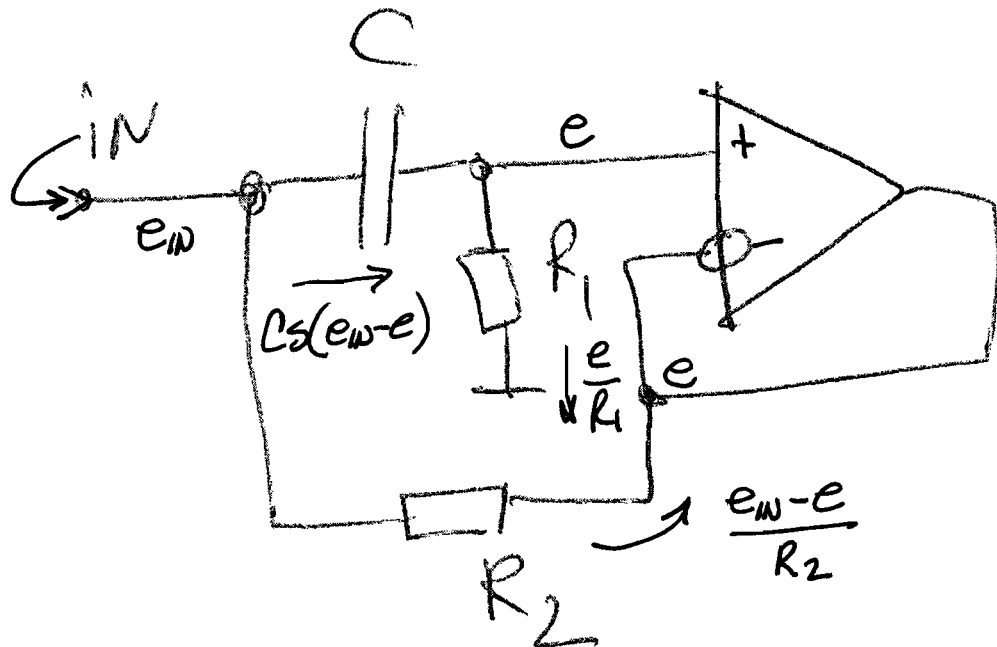
$$i_{IN} = \frac{e_{IN}}{R_2} \cdot \left[\frac{1 + \frac{R_2}{R_1} + R_2 C_1 s - 1 - (1-k)R_2 C_1 s}{1 + \frac{R_2}{R_1} + R_2 C_1 s} \right]$$

$$i_{IN} = \frac{e_{IN}}{R_2} \cdot \left[\frac{\frac{R_2}{R_1} + k R_2 C_1 s}{1 + \frac{R_2}{R_1} + R_2 C_1 s} \right]$$

$$i_{IN} = e_{IN} \cdot \left[\frac{\frac{1}{R_1} + k C_1 s}{1 + \frac{R_2}{R_1} + R_2 C_1 s} \right] = e_{IN} \frac{1 + k R_1 C_1 s}{R_1 + R_2 + R_1 R_2 C_1 s}$$

$$Z_{IN} = \frac{e_{IN}}{i_{IN}} = \frac{R_1 + R_2 + R_1 R_2 C_1 s}{1 + k R_1 C_1 s}$$

THIS IS AN INDUCTOR OF VALUE $R_1 R_2 C$ IN SERIES WITH RESISTANCE $R_1 + R_2$.
 THUS IT'S CALLED A "POOR MAN'S GYRATOR"
 IT DOESN'T LOSE INDUCTIVE EFFECT UNTIL $\omega \geq \frac{1}{k R_1 C}$ (REMEMBER THAT $k \rightarrow 0$)



TRIVIAL GYRATOR

$$L = R_1 R_2 C$$

$$C_s(e_{IN} - e) = \frac{e}{R_1} \rightarrow C_s e_{IN} = e \left(C_s + \frac{1}{R_1} \right) \rightarrow$$

$$R_1 C_s e_{IN} = e (R_1 C_s + 1) \rightarrow e = \frac{R_1 C_s}{R_1 C_s + 1} e_{IN} \rightarrow$$

$$e_{IN} - e = e_{IN} \left[1 - \frac{R_1 C_s}{R_1 C_s + 1} \right] \rightarrow e_{IN} - e = \frac{e_{IN}}{R_1 C_s + 1} \rightarrow$$

$$i_{IN} = \left(C_s + \frac{1}{R_2} \right) (e_{IN} - e) = \left(C_s + \frac{1}{R_2} \right) \cdot \frac{e_{IN}}{R_1 C_s + 1} \rightarrow$$

$$i_{IN} = \frac{R_2 C_s + 1}{R_1 C_s + 1} \cdot \frac{e_{IN}}{R_2} \rightarrow Z_{IN} = \frac{e_{IN}}{i_{IN}} \rightarrow$$

$$Z_{IN} = \frac{R_2 \cdot (R_1 C_s + 1)}{R_2 C_s + 1} = \frac{R_1 R_2 C_s + R_2}{\underbrace{R_2 C_s + 1}}$$

"INDUCTIVE", $L = R_1 R_2 C$, BUT SCREWS IT.

COMPARE TO: