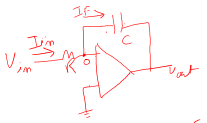


$$Z = \frac{1}{j\omega C} \; ; \; j\omega L$$

$$= -C \frac{dV_{out}}{dt}$$

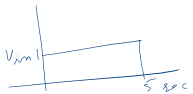
$$I_F = \frac{0 - V_{out}}{(1/j\omega C)}$$

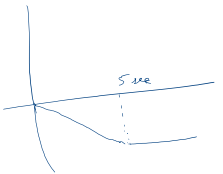
$$I_{in} = \frac{V_{in}}{R}$$

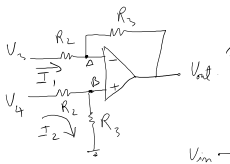
$$= -j\omega C V_{out} \quad (j\omega \rightarrow s)$$

$$V_{out} = \frac{-1}{RC} \int V_{in}\, dt$$

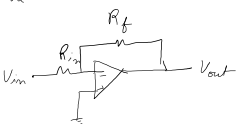
$$= -C \frac{dV_{out}}{dt}$$







$$= (V_3 - V_4)\left(\frac{-R_3}{R_2}\right)$$



$$V_B = \left(\frac{V_4}{R_2 + R_3}\right) R_3 = V_A$$

$$\frac{V_3 - V_A}{R_2} = \frac{V_A - V_{out}}{R_3}$$

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

$$V_{out} = V_{in}\left(-\frac{R_f}{R_{in}}\right)$$

$$R_3\left[V_3 - \left(\frac{V_4}{R_2 + R_3}\right)R_3\right] = \left[\left(\frac{V_4}{R_2 + R_3}\right)R_3 - V_{out}\right]R_2$$

$$\frac{R_3 V_3 (R_2 + R_3) - V_4 R_3^2}{R_2 + R_3} - \frac{V_4 R_3 R_2}{R_2 + R_3} = -V_{out} R_2$$

$$\frac{R_3 V_3 \cancel{(R_2 + R_3)} - V_4 R_3 \cancel{(R_3 + R_2)}}{\cancel{R_2 + R_3}} = -V_{out} R_2$$

$$R_3 (V_3 - V_4) = -V_{out} R_2$$