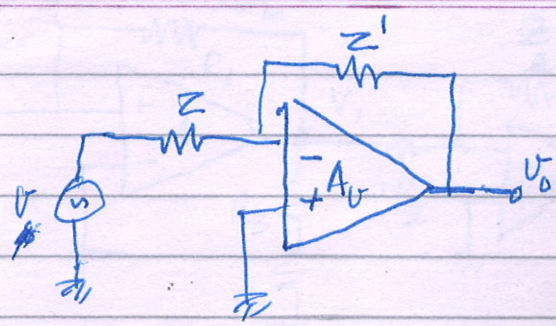
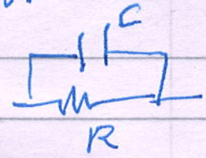
(1)



$A_v = A$

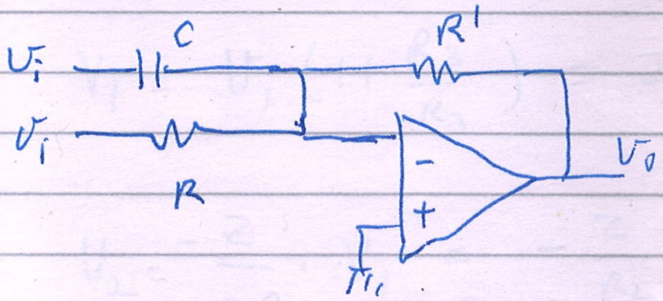
$Z =$ 

$Z' = R'$

$v = at$

Show that $V_0 = -aRC - a\frac{R'}{R}t$

Above circuit can be redrawn as following:

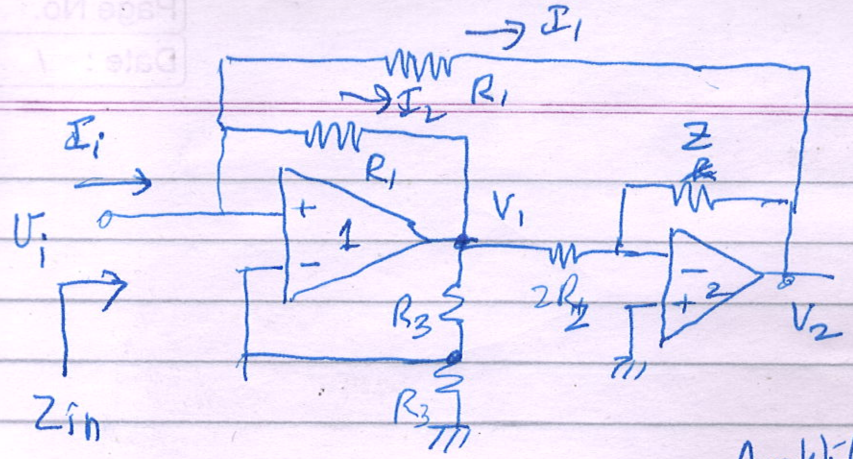


Output $V_0 = -\frac{R'}{R}V_i - R'C\frac{dV_i}{dt}$

$= -a\frac{R'}{R}t - R'Ca$

$= -aR'C - a\frac{R'}{R}t$

(2)



Amplifier 1 Non inverting amp

Amplifier 2 Inverting Amp

$$Z_{in} = \frac{V_i}{I_i}$$

$$V_1 = V_i\left(1 + \frac{R_3}{R_3}\right) = 2V_i$$

$$V_2 = \frac{-Z}{2R_2} \cdot V_1 = -\frac{Z}{R_2} V_i$$

$$I_i = I_1 + I_2 = \frac{(V_i - V_2)}{R_1} + \frac{V_i - V_1}{R_1}$$

$$= \frac{V_i + \frac{Z}{R_2} V_i}{R_1} + \frac{V_i}{R_1} - \frac{2V_i}{R_1}$$

$$= \frac{V_i}{R_1} + \frac{Z}{R_2 R_1} V_i + \frac{V_i}{R_1} - \frac{2V_i}{R_1}$$

$$= \frac{Z}{R_1 R_2} V_i$$

$$Z_{in} = \frac{V_i}{I_i} = \frac{R_1 R_2}{Z}$$

If $Z = \frac{1}{j\omega C} \Rightarrow Z_{in} = j\omega R_1 R_2 C$

which behaves like an inductor with

$$L = R_1 R_2 C$$