$m\ddot{x} = F$ $m\dot{x}$ (1)

$F = -kx$

$m\ddot{x} = -kx$ $\dot{x} = y$

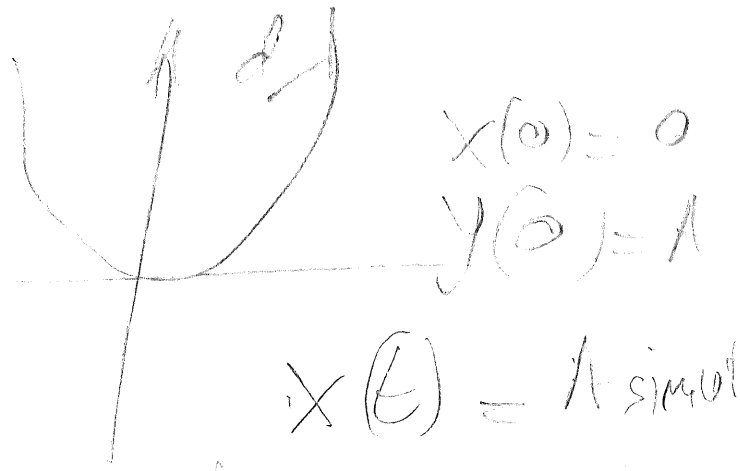
$$\begin{cases} \dot{x} = y \\ \ddot{y} = -\frac{k}{m}x \end{cases} \qquad \begin{cases} \dot{x} = y \\ \dot{y} = -\omega^2 x \end{cases} \qquad \omega^2 = \frac{k}{m}$$

$F = -\frac{\partial V}{\partial x}$

$V =$ potential

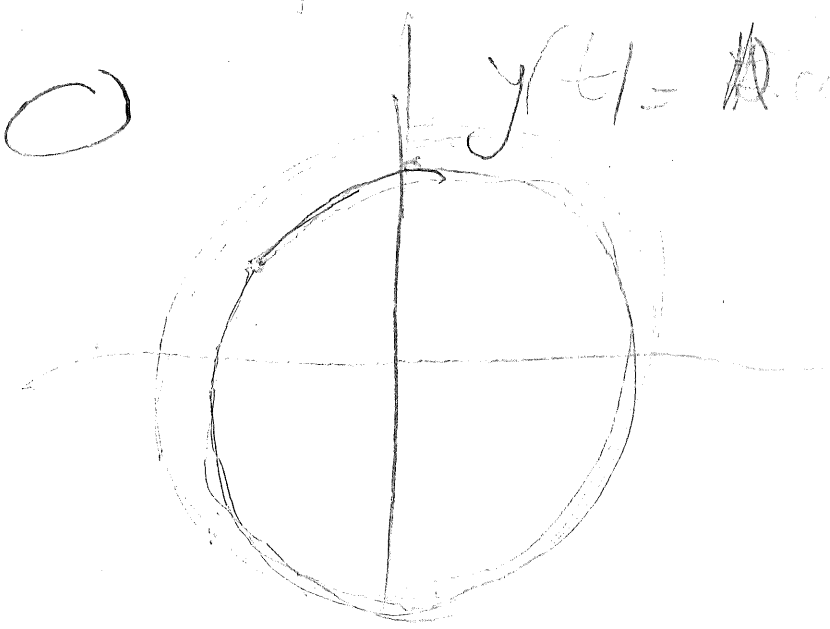
$$V = \frac{1}{2} k x^2$$

$$F = -\frac{dV}{dx}$$



$$F = -kx$$

$$m\ddot{x} + \frac{dV}{dx} = 0$$



$$m\ddot{x} + \gamma\dot{x} + \omega^2 x = F\sin(\Omega t)$$

$$\begin{cases} z = \Omega t \\ \Downarrow \\ \dot{z} = \Omega \end{cases}$$

$$\ddot{x} \quad \dot{y} = \quad \dot{z} = \Omega$$

ΑΝΑΛΟΓΑ ΜΕ ΤΟΝ ΠΑΡΑΠΑΝΩ

$x(t) = x_0 e^{j\omega t}$

$\dot{x}(t) = x_0 e^{j\omega t} j\omega$

$$\frac{V_{in}}{CR} = -V_{OUT} j\omega$$

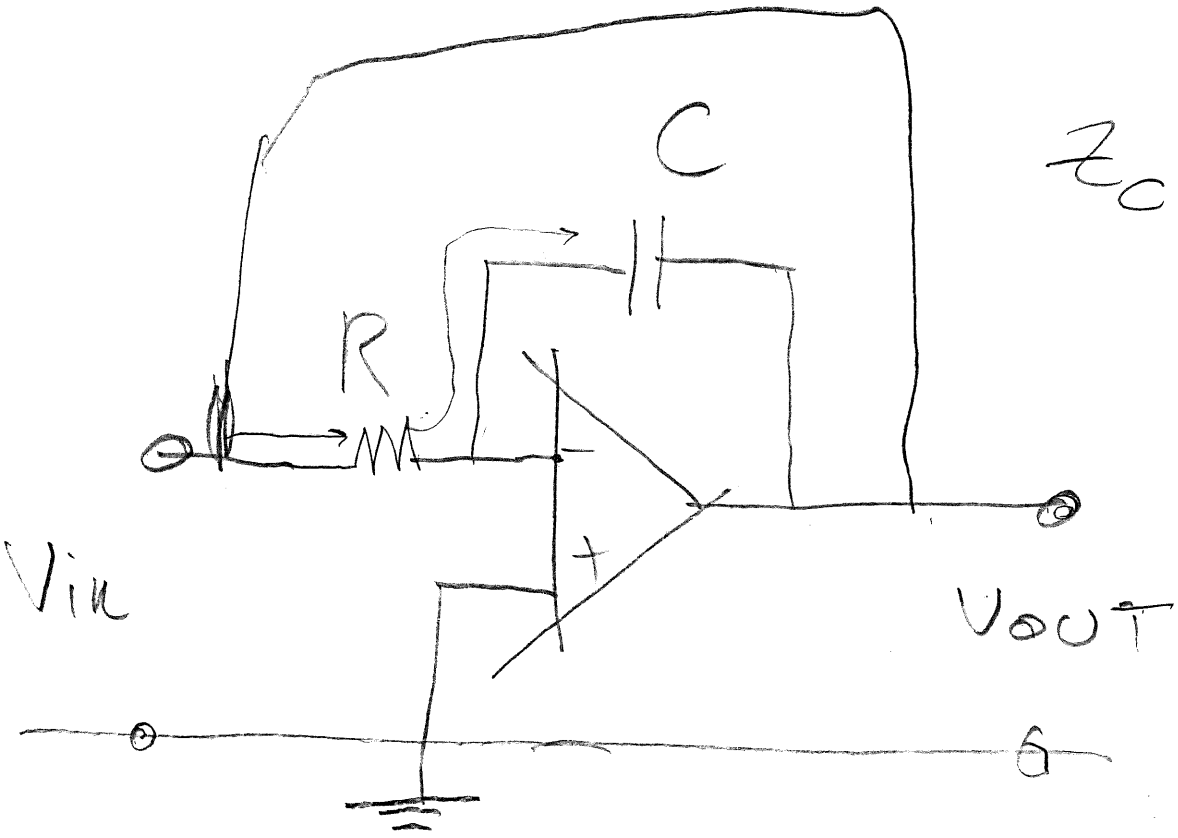
$$\frac{V_{in}(t)}{RC} = -\dot{V}_{OUT}$$

$$\dot{V}_{OUT} = -\frac{V_{in}}{RC} = -\gamma V_{in}$$

$$RC = \tau \qquad \gamma = +\frac{1}{RC}$$

$$\dot{V}_{OUT} = -\frac{1}{\gamma} V_{OUT}$$

$$\dot{x} = -\frac{1}{\tau} x$$

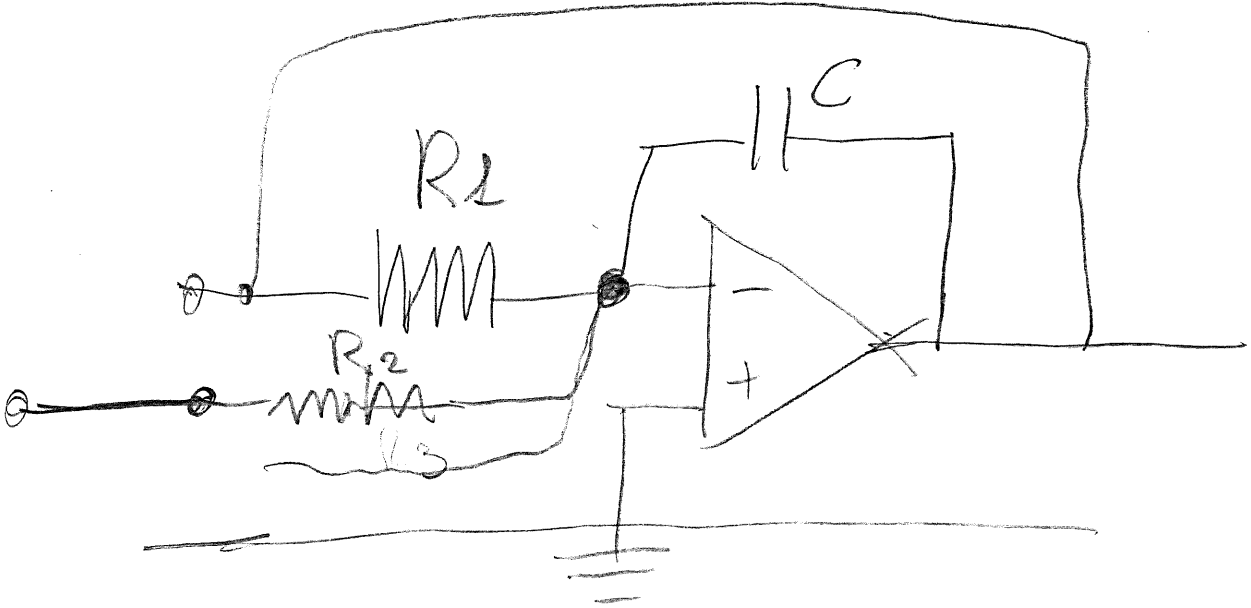


$$Z_C = \frac{1}{j\omega C}$$

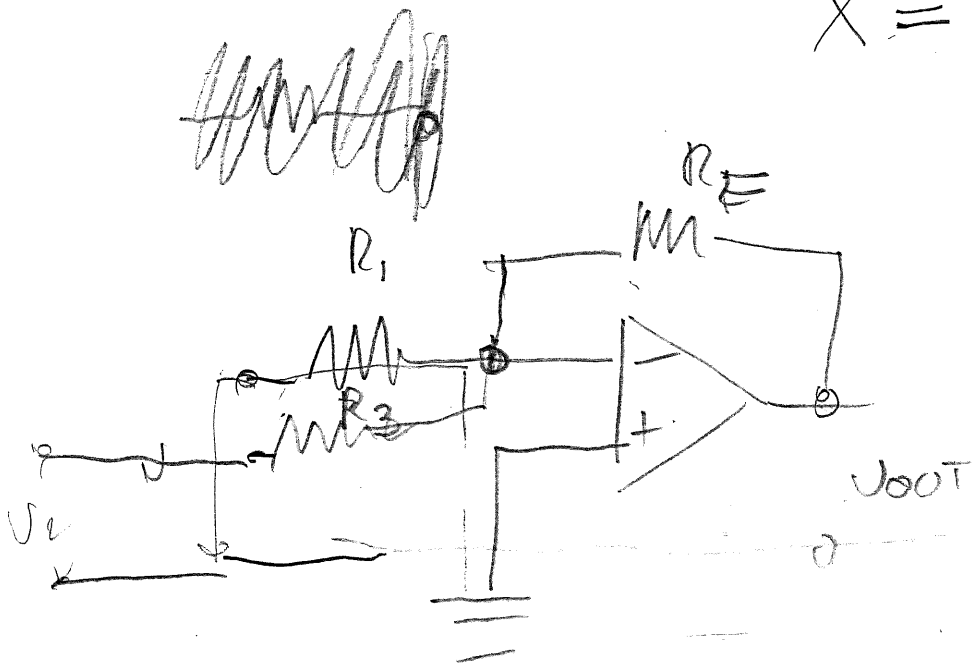
$$\frac{V_{OUT}}{V_{in}} = -\frac{Z_C}{R}$$

$$i = \frac{V_{in}}{R} \qquad i = \frac{V_{OUT}}{\frac{1}{j\omega C}} = V_{OUT}\, j\omega C$$

$$\frac{V_{in}}{R} = -V_{OUT}\, j\omega C$$



$$\dot{X} = -\frac{1}{R_1 C}\dot{X} + \frac{1}{R_2 C} + \frac{1}{R_3 C}$$



$$V_{OUT} = -\frac{R_F}{R_1} V_1 - \frac{R_F}{R_2} V_2$$