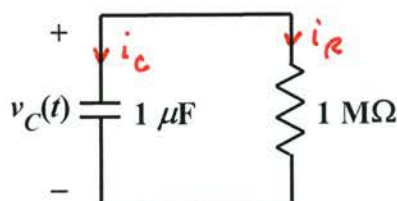


EE 2240
Problem #01

The capacitor is initially charged such that $v_C(0) = 12 \text{ V}$. Determine and solve the differential equation for $v_C(t)$ for all $t \geq 0$.



Note that $i_C = (10^{-6}) \dot{v}_C$ and $i_R = (10^{-6}) v_C$.

Then, from KCL:

$$i_C + i_R = 0$$

$$\Rightarrow (10^{-6}) \dot{v}_C + (10^{-6}) v_C = 0$$

$$\text{or } \dot{v}_C + v_C = 0$$

The characteristic equation is then

$$r + 1 = 0$$

Therefore $r = -1 \Rightarrow v_C(t) = K e^{-t}$

Since $v_C(0) = K$, and the initial condition is $v_C(0) = 12 \text{ V}$,

then $K = 12 \text{ V}$ and

$$v_C(t) = 12 e^{-t} \text{ V}, \quad t \geq 0$$