First Order – RC Circuit – Initial Conditions

Table 3-1 Voltage and current relationships

unknown	R	C	L
i	$\frac{v}{R}$	$C\frac{dv}{dt}$	$\frac{1}{L}\int_0^t v\,dt + I_o$
v	$i \times R$	$\frac{1}{C}\int_0^t i\,dt + V_o$	$L\frac{di}{dt}$

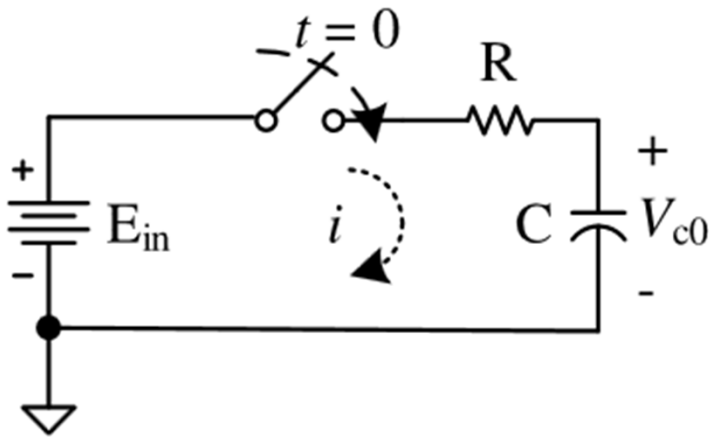


Figure 3-16 RC circuit with a step input

- $v_C(0) =$ _____
- $v_R(0) =$ _____
- $i(0) =$ _____

- $v_C(\infty) =$ _____
- $v_R(\infty) =$ _____
- $i(\infty) =$ _____

First Order – RC Circuit – KVL Standard Form

Table 3-1 Voltage and current relationships

unknown	R	C	L
i	$\frac{v}{R}$	$C\frac{dv}{dt}$	$\frac{1}{L}\int_0^t v\,dt + I_o$
v	$i \times R$	$\frac{1}{C}\int_0^t i\,dt + V_o$	$L\frac{di}{dt}$

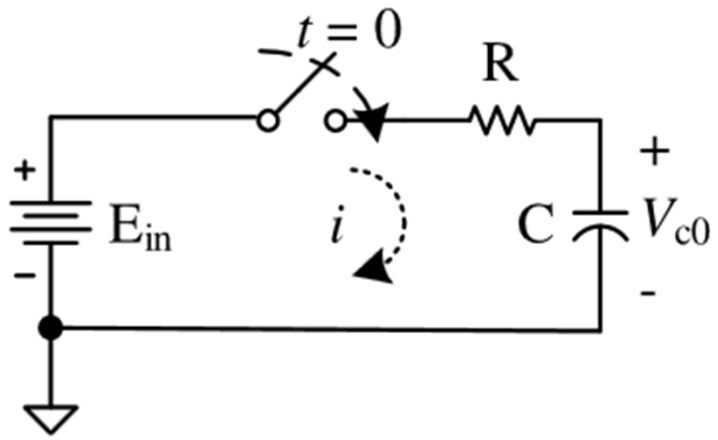
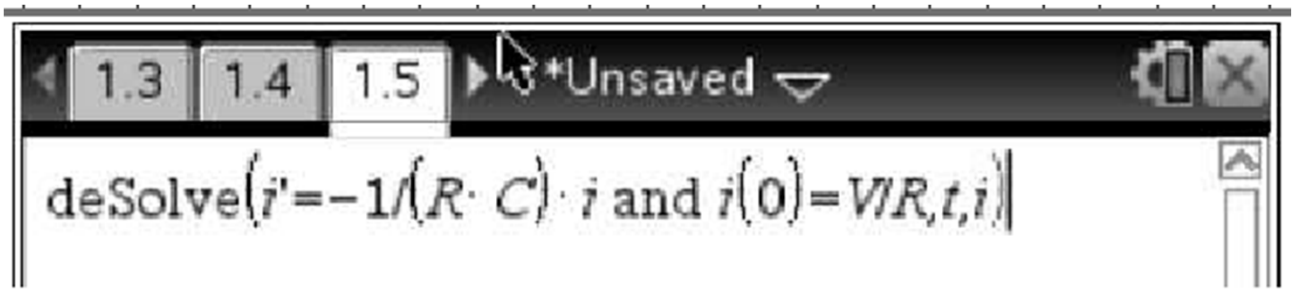


Figure 3-16 RC circuit with a step input

de Solve

$$i' = -\frac{1}{\mathrm{RC}} i \qquad i_{0^+} = \frac{V_{R0^+}}{R} = \frac{E_{\mathrm{in}}}{R}$$

- entry



- The prime is on the **π** menu.
- Spaces before and after **and** are necessary.
- Then enter the initial conditions equation,
- Followed by a comma, the *x* variable, and the y variable.

ν_R ?

v_C ?

Substitute answers into KVL

Table 3-1 Voltage and current relationships

unknown	R	C	L
i	$\frac{v}{R}$	$C\frac{dv}{dt}$	$\frac{1}{L}\int_0^t v\,dt + I_o$
v	$i \times R$	$\frac{1}{C}\int_0^t i\,dt + V_o$	$L\frac{di}{dt}$

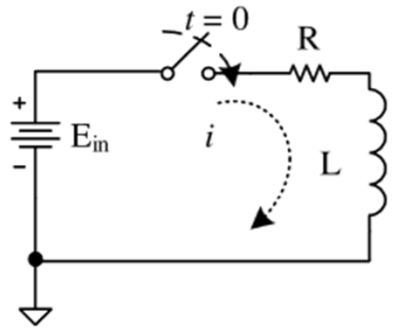


Figure 3-24 RL circuit with a step