The circuit shown initially has the capacitor uncharged, and the switch open. At time $t = 0$, the switch is thrown. Write all answers in terms of E, R, and C as needed.

(a) At $t = 0^+$, <u>immediately</u> after the switch is thrown what is the current $I(0^+)$?
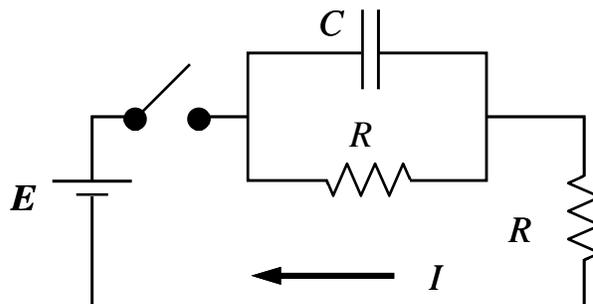
(b) After a very long time, what is the current I_∞?

(c) After a very long time, what is the charge on the capacitor Q_∞?

(d) Assume $Q(t) = Q_\infty(1 - \exp(-\beta t))$ gives the charge on the capacitor as a function of time. Use $\left[\dfrac{dQ}{dt}\right]_{0^+} = I(0^+)$ and your answers to **(a)** and **(c)** to compute β. Why does $\left[\dfrac{dQ}{dt}\right]_{0^+} = I(0^+)$?

What does your β imply for the effective resistance that you use in $\tau = R_{\text{effective}}\ C$?

(e) Use KVL for a loop that includes the capacitor and the battery to compute $I(t)$. Check that your answers are consistent with your answers to parts (a) and (b).