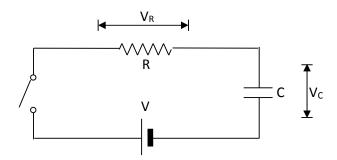
PHY 232 Fall 2017 Supplementary Work (Not to be collected) Class 25. RC Circuits

PART A.



If Q is the charge stored in the capacitor and I is the current from the battery. Switch is closed at t=0.

(a) What is the value of the following quantities at t=0 (in terms of V, R, and C):

$$Q = \underline{\hspace{1cm}} 0 \hspace{1cm} I = \underline{\hspace{1cm}} V/R \hspace{1cm} V_C = \underline{\hspace{1cm}} 0 \hspace{1cm} V_R = \underline{\hspace{1cm}} V$$

(b) What is the value of the following quantities at $t=\infty$ (in terms of V, R, and C):

$$Q = \underline{\hspace{1cm}} V \qquad \qquad V_{C} = \underline{\hspace{1cm}} V \qquad \qquad V_{R} = \underline{\hspace{1cm}} 0$$

(c) Write down the following quantities as a function of time (in terms of V, R, C, and t):

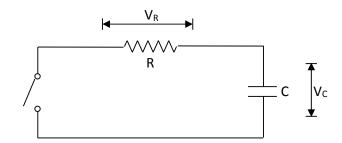
$$Q(t) = \frac{CV(1 - e^{-\frac{t}{RC}})}{V(t)}$$

$$V_{c}(t) = \frac{V}{R}e^{-\frac{t}{RC}}$$

$$V_{c}(t) = \frac{V(1 - e^{-\frac{t}{RC}})}{V(t)}$$

$$V_{c}(t) = Ve^{-\frac{t}{RC}}$$

PART B.



If Q is the charge stored in the capacitor and I is the current through R. The capacitor is originally charged with a charge of Q_0 . Switch is closed at t=0.

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١	u	vviiat is the value o	I the following	qualitities at t-0	ini tering or v	, IX, and Qu).

$$Q = Q_0 = Q_0/RC$$
 $I = Q_0/(RC)$ $V_C = Q_0/C$ $V_R = Q_0/C$

(b) What is the value of the following quantities at $t=\infty$ (in terms of V, R, and Q₀):

(c) Write down the following quantities as a function of time (in terms of V, R, Q₀ and t):

$$Q(t) = Q_0 e^{-\frac{t}{RC}}$$

$$I(t) = \frac{Q_0}{RC} e^{-\frac{t}{RC}}$$

$$V_C(t) = \frac{Q_0}{C} e^{-\frac{t}{RC}}$$

$$V_R(t) = \frac{Q_0}{C} e^{-\frac{t}{RC}}$$