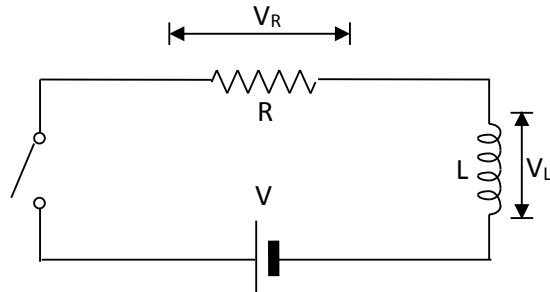PHY 232 Summer 2016 Class Work

Class 35. Work on Last Class - RL Circuit

PART A.

Switch is closed at t=0.

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

I = _____0_____ V_L= _____V_____ V_R= _____0_____

(b) What is the value of the following quantities at t=∞ (in terms of V, R, and L):

I = _____V/R_____ V_L= _____0_____ V_R= _____V_____

(c) Write down the following quantities as a function of time (in terms of V, R, L, and t):
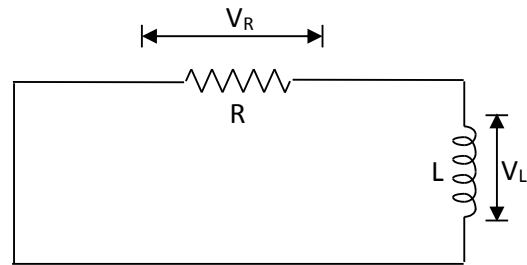
$I(t) = \dfrac{V}{R}(1-e^{-\frac{R}{L}t})$

$V_L(t) = Ve^{-\frac{R}{L}t}$

$V_R(t) = V(1-e^{-\frac{R}{L}t})$

$P_R(t) = \dfrac{V^2}{R}(1-e^{-\frac{R}{L}t})^2$ (P_R = Power dissipated in R)

$U_L(t) = \dfrac{LV^2}{2R^2}(1-e^{-\frac{R}{L}t})^2$ (U_L = Energy stored in R)

PART B.

If current through the resistor is I_0 at t=0.

(a) What is the value of the following quantities at t=0 (in terms of V, R, L and I_0):

$I =$ ___I_0 (Given)___ $V_L=$ ___I_0R___ $V_R=$ ___I_0R___

(b) What is the value of the following quantities at t=∞ (in terms of V, R, L and I_0):

$I =$ ___0___ $V_L=$ ___0___ $V_R=$ ___0___

(c) Write down the following quantities as a function of time (in terms of V, R, L, I_0 and t):

$I(t) =$ ___$I_0 e^{-\frac{R}{L}t}$___

$V_L(t) =$ ___$I_0 R e^{-\frac{R}{L}t}$___

$V_R(t) =$ ___$I_0 R e^{-\frac{R}{L}t}$___

$P_R(t) =$ ___$I_0^2 R e^{-\frac{2R}{L}t}$___ ($P_R$ = Power dissipated in R)

$U_L(t) =$ ___$\frac{1}{2}LI_0^2 e^{-\frac{2R}{L}t}$___ ($U_L$ = Energy stored in R)