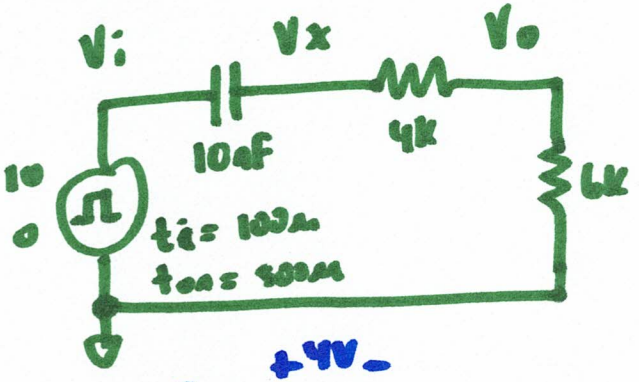
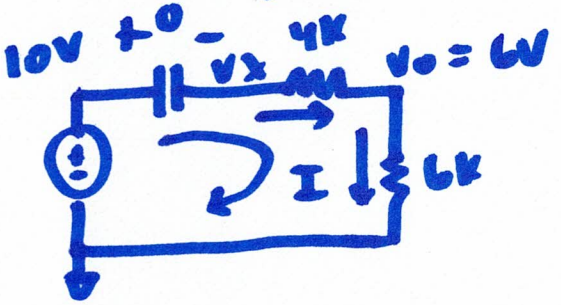
EE 220: Circuits I

HW14.3B



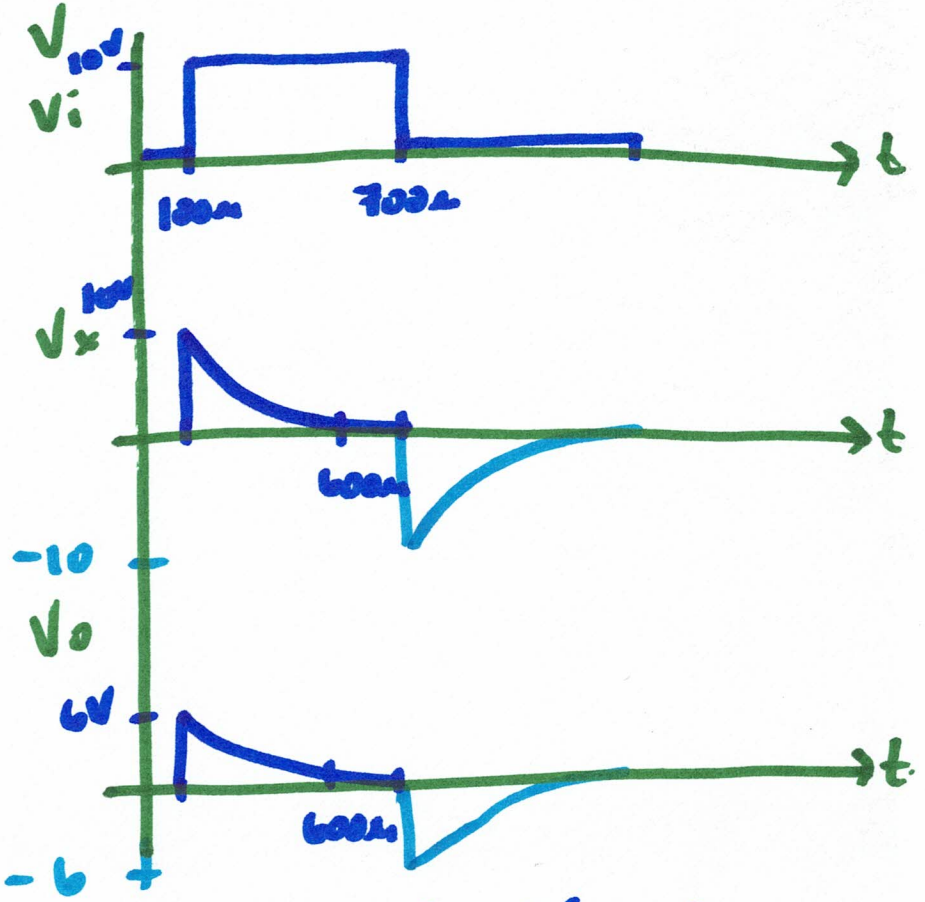
$\tau = 100ms$



$$10V + 0 - I \cdot 4k - I \cdot 6k = 0$$

$$10V = I \cdot 10k$$

$$I = 1mA$$



V_x: $V_i = 10V$, $V_f = 0V$

$$V_x(t) = 10e^{-(t-100m)/100m}$$

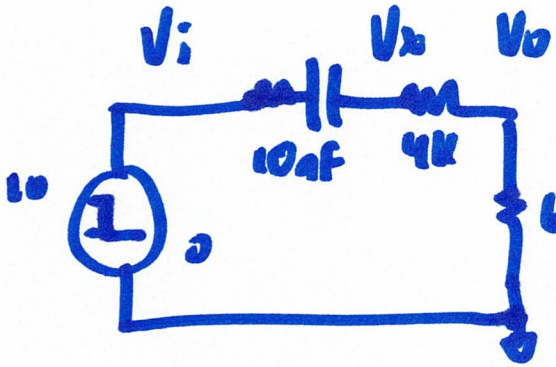
$100m \le t \le 700m$

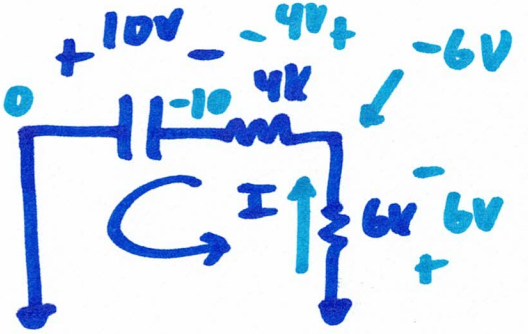
V_o: $V_i = 6V$, $V_f = 0V$

$$V_o(t) = 6e^{-(t-100m)/100m}$$

$$v(t) = V_f + (V_i - V_f)e^{-t/\tau}$$

HW14.30





V_x: $V_i = -10$, $V_f = 0$

V_o: $V_i = -6$, $V_f = 0$

(KVL) $-I \cdot 6K - I \cdot 4K + 10V = 0$

$10V = I \cdot 10K$

$\boxed{I = 1mA}$

$$\boxed{V_x(t) = -10e^{-(t-700ms)/100ms}} \quad \text{for } t \geq 700ms$$

$$V_x(t) = \begin{cases} 0, & t < 100ms \\ 10e^{-(t-100ms)/100ms}, & 100ms \leq t < 700ms \\ -10e^{-(t-700ms)/100ms}, & t \geq 700ms \end{cases}$$

$\tau_c = R \cdot C$

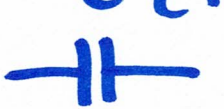
$\tau_L = L/R$

$E = \frac{1}{2} C \cdot V^2$

$E = \frac{1}{2} L \cdot I^2$

Inductors

C (Farads) F

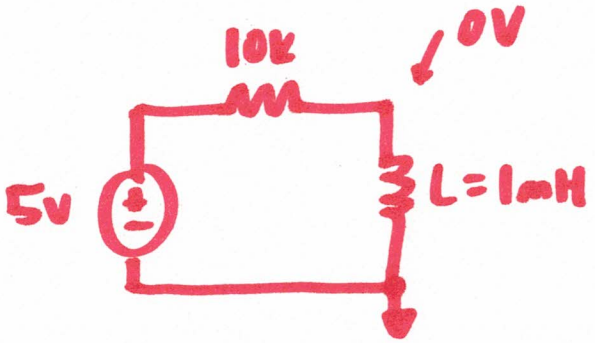


$I_c = C \cdot \frac{dV_c}{dt}$

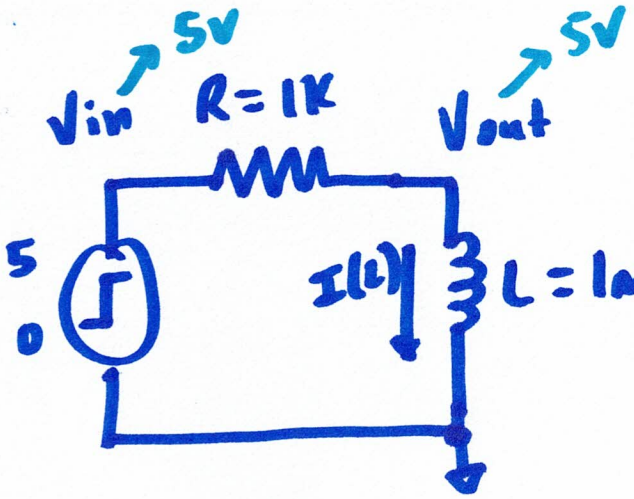
L (Henrys) H

$V_L = L \cdot \frac{dI_L}{dt}$

* open in DC circuit
* short in DC circuits

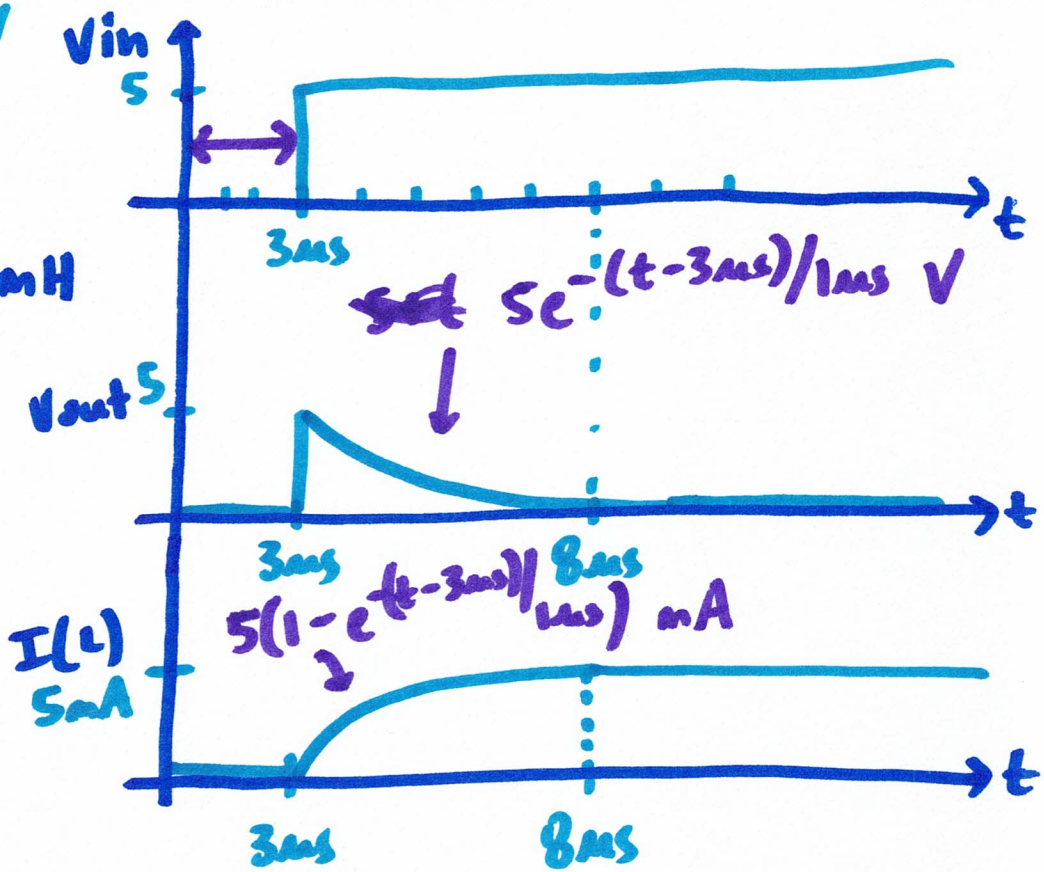


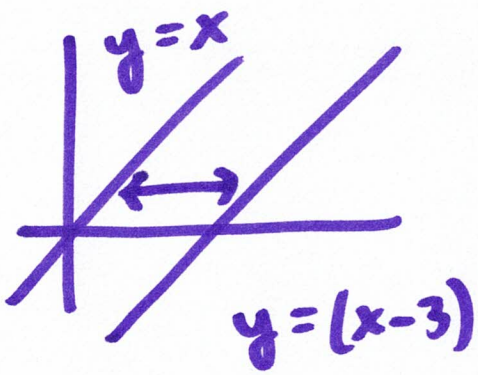
* store energy in form of a magnetic (B) field
* store energy in form of electric (E) field



$$V_L = L \cdot \frac{dI_L}{dt}$$

$$\tau = \frac{L}{R} = \frac{1mH}{1K\Omega} = 1\mu s$$





Voltage: $V(t) = V_f + (V_i - V_f)e^{-t/\tau}$

Current: $I(t) = I_f + (I_i - I_f)e^{-t/\tau}$

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