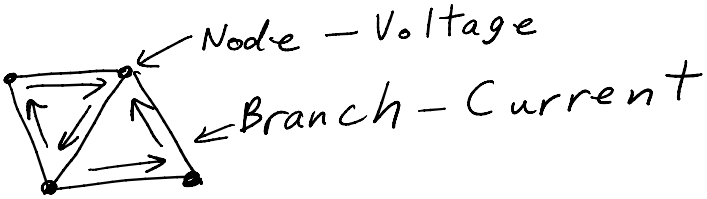
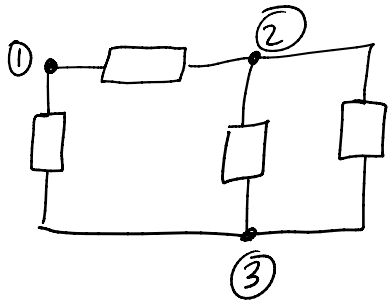
Discussion 1

Friday, April 1, 2022 8:10 PM

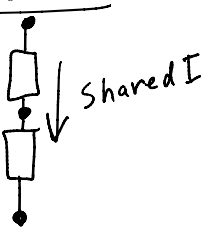




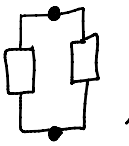
Resistor	R	$V=IR$	Dissipates Energy
Capacitor	C	$I=C\frac{dV}{dt}$	Stores Energy E-field
Inductors	L	$V=L\frac{dI}{dt}$	Stores Energy B-field
Voltage Source	V		
Current Source	I		

Series

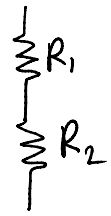
(3-node)



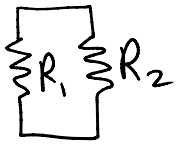
Parallel



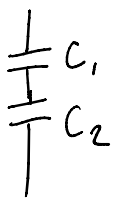
(2-node)



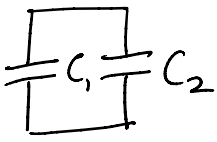
$R_{eq} = R_1 + R_2$



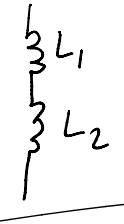
$R_{eq} = \left(\frac{1}{R_1}+\frac{1}{R_2}\right)^{-1} = \frac{R_1 R_2}{R_1+R_2}$



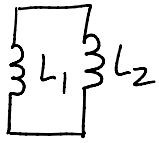
$C_{eq} = \frac{C_1 C_2}{C_1+C_2}$



$C_{eq} = C_1 + C_2$



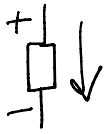
$L_{eq} = L_1 + L_2$

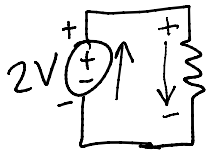


$L_{eq} = \frac{L_1 L_2}{L_1+L_2}$

§ 1.2

Passive Sign Convention





$I_R = \frac{V}{R} = 2A$

$P = IV$

$P_R = 2 \cdot 2 = 4W$

$P_S = 2 \cdot (-2) = -4W$

$$E = \int P\,dt$$

Capacitor: $I = C\frac{dV}{dt}$

$P_c = C\frac{dV}{dt}V$

$\int P_c\,dt = C\int V\,dV$

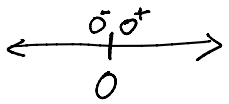
$E_c = \frac{1}{2}CV^2$

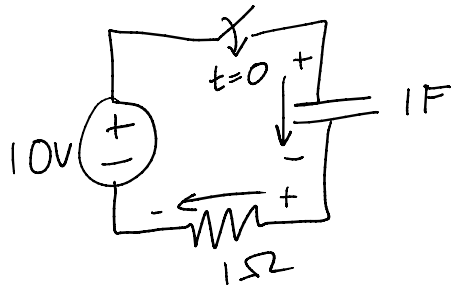
Inductor: $V = L\frac{dI}{dt}$

$P_L = IL\frac{dI}{dt}$

$\int P_L\,dt = L\int I\,dI$

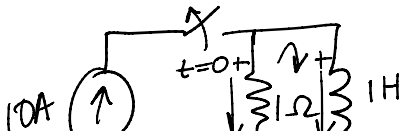
$E_L = \frac{1}{2}LI^2$





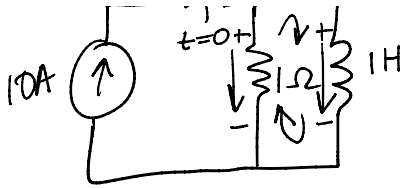
$V_{C0^-} = 0V \quad V_{C0^+} = 0V \quad V_{C\infty} = 10V$

$V_{R0^-} = 0V \quad V_{R0^+} = 10V \quad V_{R\infty} = 0V$

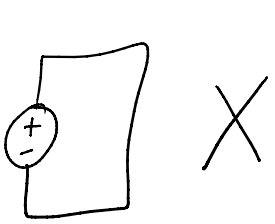


$I_{L0^-} = 10A \quad I_{L0^+} = 10A \quad I_{L\infty} = 0A$

$I_{R0^-} = 0A \quad I_{R0^+} = -10A \quad I_{R\infty} = 0A$



$I_{L0^-} = 10A$ $I_{R0^-} = 0A$ $I_{R0^+} = -10A$ $I_{R\infty} = 0A$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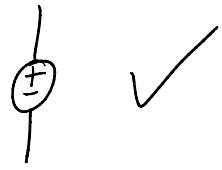
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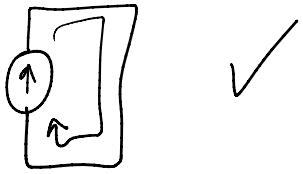
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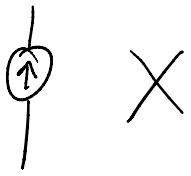
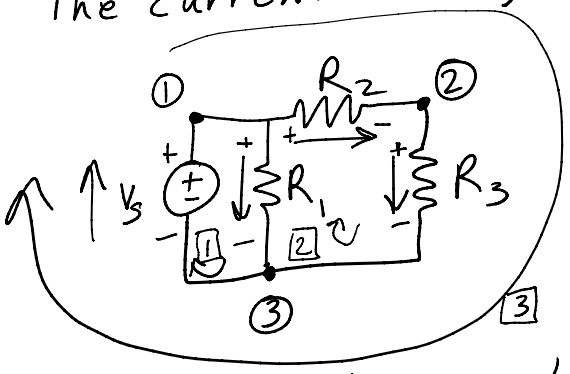

X

Kirchoff's Current Law (KCL)

The current coming in to a node = current coming out



① $I_s = I_1 + I_2$

② $I_2 = I_3$

③ $I_1 + I_3 = I_s$

Kirchoff's Voltage Law

The sum of voltage increases = sum of voltage drops for a loop.

1 $V_s = V_1$

2 $V_1 = V_2 + V_3$

3 $V_s = V_2 + V_3$