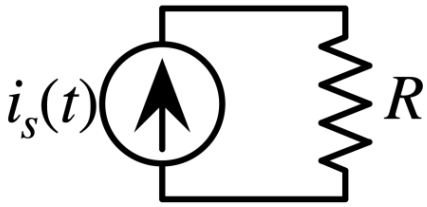
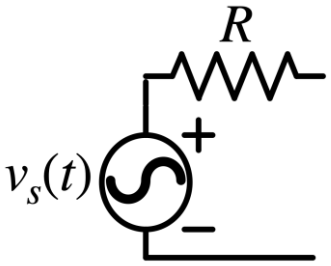
Sinusoidal Source Transformation in Time Domain

1. **Current Source + Shunt R → Voltage Source + Series R**

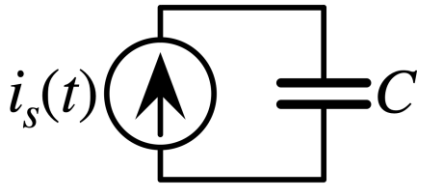


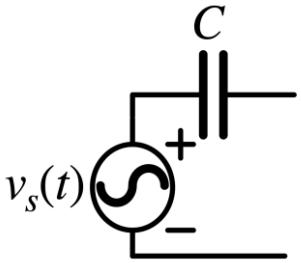


$i_s(t) = I_S \sin(\omega t)$ $\quad$ $v_s(t) = I_S R \sin(\omega t)$

$i_s(t)$ & $v_s(t)$ *are in phase*

2. **Current Source + Shunt C → Voltage Source + Series C**

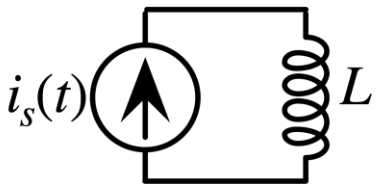


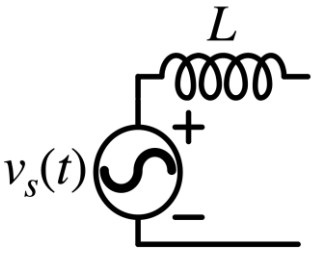


$i_s(t) = I_S \sin(\omega t)$ $\quad$ $v_s(t) = I_S |X_C| \sin(\omega t - 90^o)$

$|X_C| = \frac{1}{\omega C}$, $i_s(t)$ *leads* $v_s(t)$ *by* 90^o

3. **Current Source + Shunt L → Voltage Source + Series L**

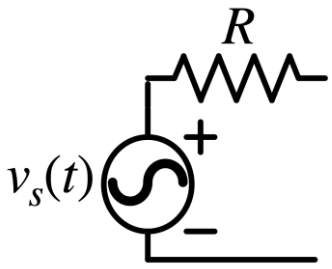


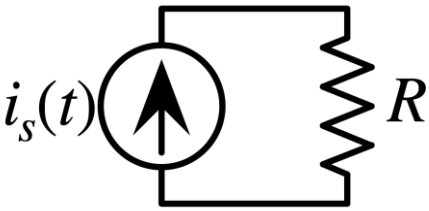


$i_s(t) = I_S \sin(\omega t)$ $\quad$ $v_s(t) = I_S |X_L| \sin(\omega t + 90^o)$

$|X_L| = \omega L$, $v_s(t)$ *leads* $i_s(t)$ *by* 90^o

4. **Voltage Source + Series R → Current Source + Shunt R**



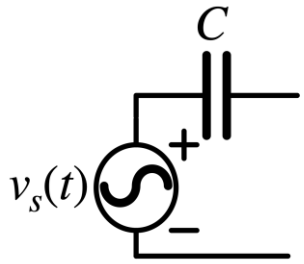


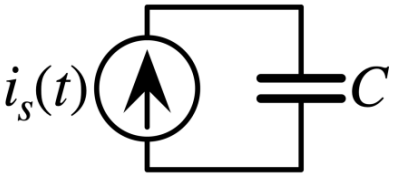
$$v_s(t) = V_S \sin(\omega t)$$

$$i_s(t) = \frac{V_S}{R}\sin(\omega t)$$

$i_s(t)$ & $v_s(t)$ *are in phase*

5. **Voltage Source + Series C → Current Source + Shunt C**



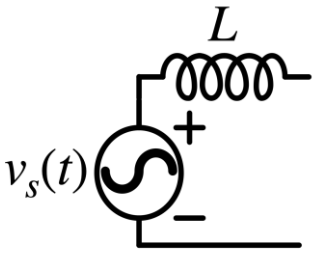


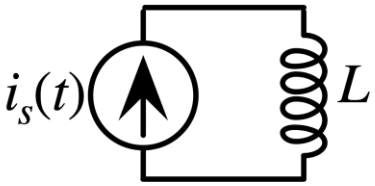
$$v_s(t) = V_S \sin(\omega t)$$

$$i_s(t) = \frac{V_S}{|X_C|}\sin(\omega t + 90^o)$$

$|X_C| = \frac{1}{\omega C}$, $i_s(t)$ *leads* $v_s(t)$ *by* 90^o

6. **Voltage Source + Series L → Current Source + Shunt L**





$$v_s(t) = V_S \sin(\omega t)$$

$$i_s(t) = \frac{V_S}{|X_L|}\sin(\omega t - 90^o)$$

$|X_L| = \omega L$, $v_s(t)$ *leads* $i_s(t)$ *by* 90^o