

Results

$$(a) \quad v_c(t) = \begin{cases} 0 \text{ volts}, & t < 0 \\ 13.3e^{-20,000t} - 13.3e^{-5,000t} \text{ volts}, & t \geq 0 \end{cases}$$

$$i_R(t) = \begin{cases} 0 \text{ A}, & t < 0 \\ 1.67e^{-20,000t} - 1.67e^{-5,000t} \text{ A}, & t \geq 0 \end{cases}$$

$$P_L(t) = \begin{cases} 0 \text{ W}, & t < 0 \\ -4.44e^{-40,000t} + 22.2e^{-25,000t} - 17.8e^{-10,000t} \text{ W}, & t \geq 0 \end{cases}$$

$$w_L(t) = \begin{cases} 1.0 \text{ mJ}, & t < 0 \\ 1.11e^{-40,000t} - 0.89e^{-25,000t} + 1.78e^{-10,000t} \text{ mJ}, & t \geq 0 \end{cases}$$

$$w_c(t) = \begin{cases} 0 \text{ J}, & t < 0 \\ 0.44e^{-40,000t} - 0.889e^{-25,000t} + 0.44e^{-10,000t} \text{ mJ}, & t \geq 0 \end{cases}$$

$$i_L(t) = \begin{cases} 1 \text{ A}, & t < 0 \\ -0.33e^{-20,000t} + 1.33e^{-5,000t} \text{ A}, & t \geq 0 \end{cases}$$

Results

(b)

$$v_c(t) = \begin{cases} 0 \text{ V} & , t < 0 \\ 20.1 e^{-1000t} \cos(\underbrace{9950t + 90^\circ}_{= 1.58 \text{ kHz}}) \text{ V} & , t \geq 0 \end{cases}$$

$$i_R(t) = \begin{cases} 0 \text{ A} & , t < 0 \\ 20.1 e^{-1000t} \cos(9950t + 90^\circ) \text{ mA} & , t \geq 0 \end{cases}$$

$$i_L(t) = \begin{cases} 1 \text{ A} & , t < 0 \\ 1.01 e^{-1000t} \cos(9950t - 5.74^\circ) \text{ A} & , t \geq 0 \end{cases}$$

$$P_L(t) = v_c(t) \cdot i_L(t)$$

$$w_C(t) = \frac{1}{2} C v_c^2(t)$$

$$w_L(t) = \frac{1}{2} L i_L^2(t)$$

NOTE: typical Maple output is $x(t) = A e^{-\sigma t} \cos(\omega_d t) + B e^{-\sigma t} \sin(\omega_d t)$

Convert to standard form like this:

find $K = A - jB$, then $|K|$ & $\angle K = \theta$

$$\Rightarrow x(t) = |K| e^{-\sigma t} \cos(\omega_d t + \theta)$$