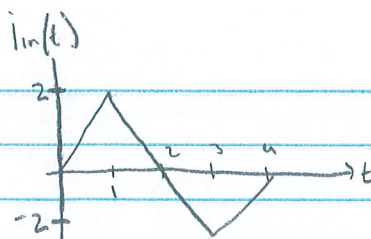
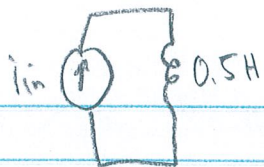
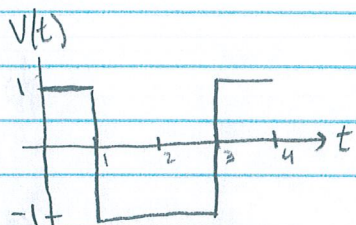


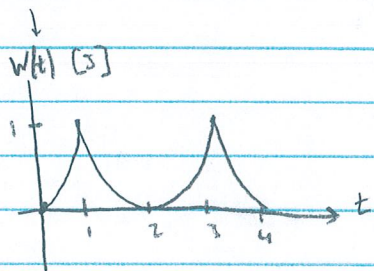
7.2



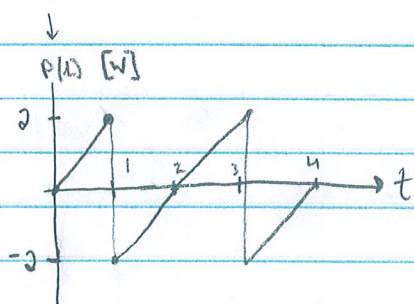
a) $V = L di/dt$



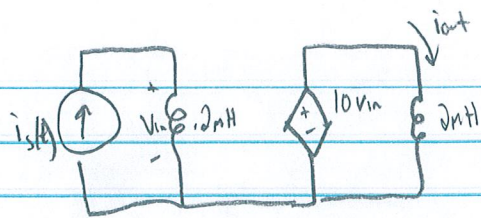
b) $W(t) = \frac{1}{2} L i(t)^2$



c) $P(t) = i(t) v(t)$



7.4

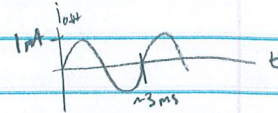


$$i_s(t) = 10 \sin(2000t) \text{ mA}$$

$$i(0) = 0$$

a) $v_{in}(t) = L \cdot di/dt = .0002 \left(20 \cos(2000t) \right) \overset{\substack{\downarrow \text{ in Amps.}}}{=} 0.004 \cos(2000t)$

$$V_{out} = 10 v_{in} = 0.04 \cos(2000t)$$



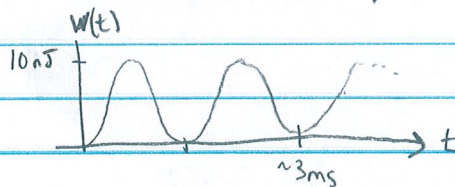
$$i_{out} = \frac{1}{L_2} V_{out} = 0.01 \sin(2000t) = \boxed{10 \sin(2000t) \text{ mA}}$$

b) $P_{out} = V_{out} i_{out}$
 $= [0.04 \cos(2000t)] [0.01 \sin(2000t)]$

$$= 4 \times 10^{-4} \cos(2000t) \sin(2000t) = \boxed{0.2 \sin(4000t) \text{ mW}}$$

c) $W = \frac{1}{2} L_2 i_{out}^2$

$$= \frac{1}{2} (.002) (.01 \sin(2000t))^2 = \boxed{10^{-7} \sin^2 2000t \text{ J}}$$



7.11 $\frac{1}{\text{---}} 20 \mu\text{F}$ $V_c = 100\text{v}$.

a) $Q = CV = (20 \mu\text{F})(100\text{v}) = \boxed{\pm 2 \text{ mC}}$

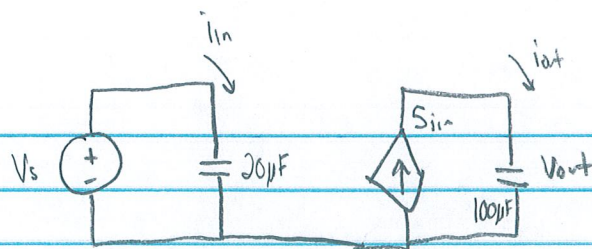
b) $Q = CV \rightarrow 2 \text{ mC} = (5 \mu\text{F}) V_c \rightarrow \boxed{V_c = 400\text{v}}$

c) $50 \mu\text{C} = (2 \mu\text{F}) V_c \rightarrow \boxed{V_c = 25\text{v}}$

d) $W = \frac{1}{2} CV^2$

$= \frac{1}{2} (20 \mu\text{F}) (100\text{v})^2 \rightarrow \boxed{0.1 \text{ J}}$

7.17



$$V_s(t) = 5 \sin(2000t)$$

$$V_{out}(0) = 10 \text{ V}$$

$$a) \quad V_{out} = V_{out}(0) + \frac{1}{C} \int_0^t i_{out}(\tau) d\tau$$

$$i_{out}(t) = 5 i_{in}(t) \quad i_{in}(t) = C_{in} \frac{dV_{in}}{dt} = (20 \text{ pF}) 5(2000) \cos(2000t) \\ = 0.2 \cos(2000t)$$

$$i_{out} = \cos(2000t)$$

$$V_{out} = 10 + \frac{1}{100 \text{ pF}} \int_0^t \cos(2000\tau) d\tau$$

$$= 10 + \frac{10000}{2000} \sin(2000t) = \boxed{10 + 5 \sin(2000t) \text{ V}}$$

→ V_{out} independent of $V_{in}(0)$ because it depends on $\frac{dV_{in}}{dt}$.

$$b) \quad P_{out} = V_{out} i_{out} = [10 + 5 \sin(2000t)] [\cos(2000t)]$$

$$= \boxed{10 \cos(2000t) + 2.5 \sin(4000t) \text{ W}}$$

$$c) \quad W = \frac{1}{2} C V^2 = \frac{1}{2} (100 \text{ pF}) [10 + 5 \sin(2000t)]^2$$

$$= \boxed{5 \times 10^{-5} (100 + 100 \sin(2000t) + 25 \sin^2(2000t)) \text{ J}}$$