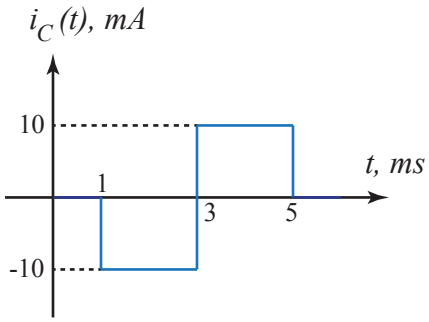
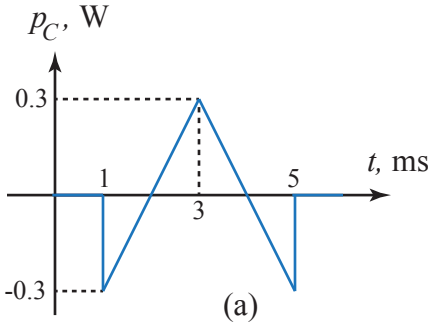
University of Calgary
Department of Electrical and Computer Engineering

ENGG 225 - Fundamentals of Electrical Circuits and Machines
Winter, 2017

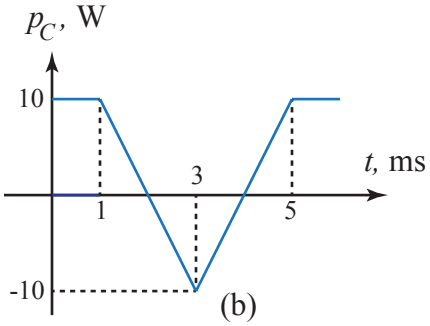
Problem Assignment #6

1. **[2 marks.]** The current $i_C(t)$ through a 1 μF capacitor is shown below. At $t = 0$, the voltage is $v_C(t) = 10$ V. Select the appropriate sketch from the choices below for the capacitor power $p_C(t)$ versus time.

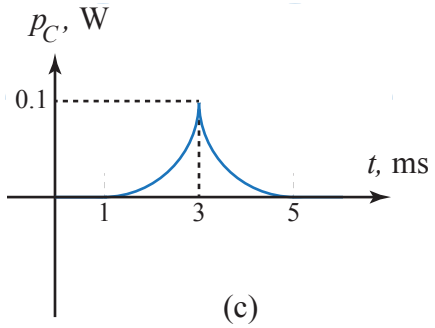




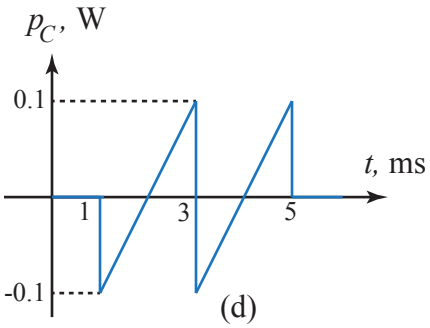
(a)



(b)



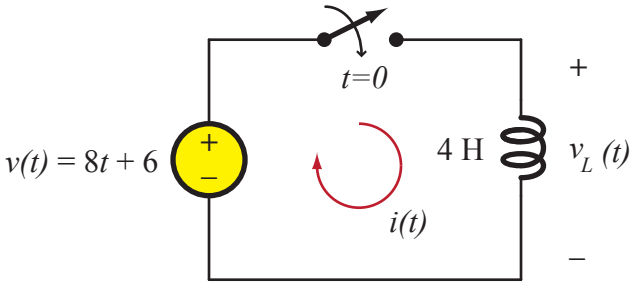
(c)



(d)

(e) None of the above.

2. **[2 marks.]** The switch in the circuit shown at right is initially open, and then closes at time $t = 0$. Find the power $p_L(t)$ at time $t = 2$ s in the inductor. Express your answer in *Watts (W)*.

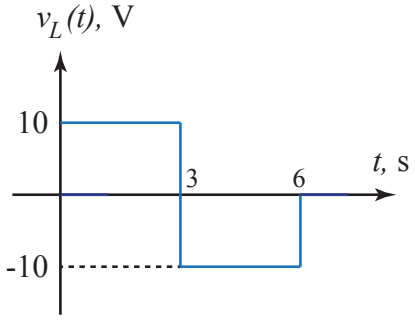


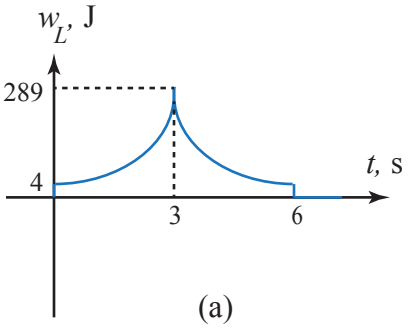
3. **[1 mark.]** Find the stored energy $w_L(t)$ at $t = 2$ s for the inductor in the circuit of Question 2. Express your answer in *Joules (J)*.

4. **[2 marks.]** A 20 μF capacitor has a voltage given by $v_C(t) = 10\sin(10^4 t) + 5\cos(10^4 t)$ V. Assume that the arguments of sine and cosine are in radians. Find the capacitor power $p_C(t)$ at $t = 0.5$ ms, and express it in *Watts (W)*.

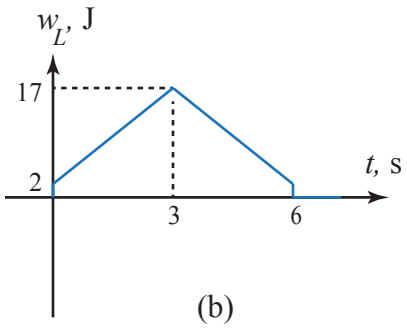
5. **[1 mark.]** Before $t = 0$, the voltage $v_C(t)$ on a 40 μF capacitor is zero. Starting at $t = 0$, the voltage is increased linearly with time to 20 V in 0.5 s. Then, the voltage remains constant at 20 V. What is the power in the capacitor at $t = 0.4$ s? Give your answer in *milliWatts (mW)*.

6. **[2 marks.]** The voltage $v_L(t)$ across a 2 H inductor is shown at right. The initial current in the inductor is $i_L(0) = 2$ A. Select the appropriate sketch from the choices below for the inductor energy $w_L(t)$ versus time.

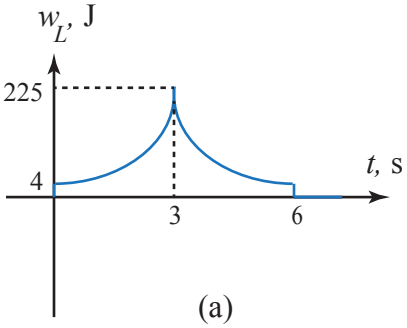


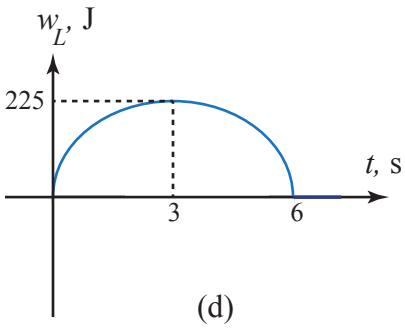


(a)



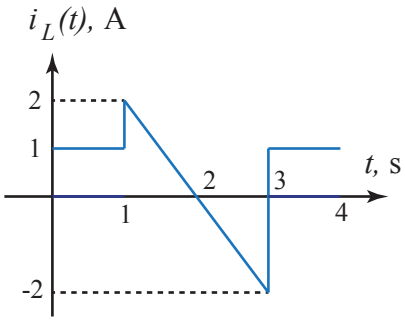
(b)

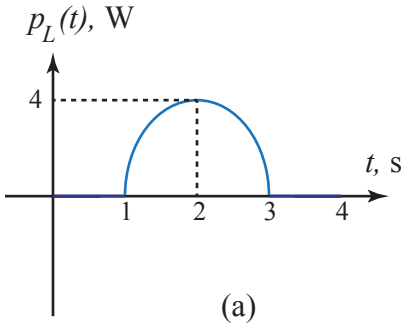


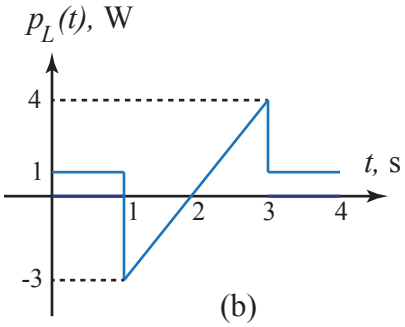


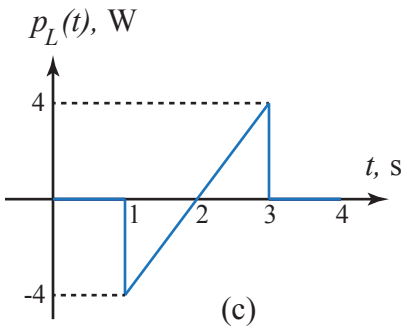
(e) None of the above.

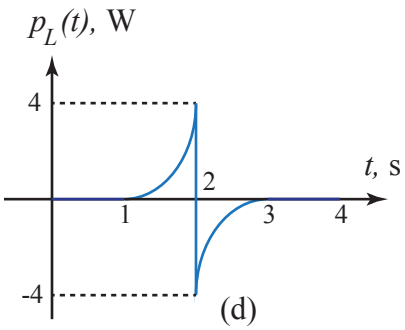
7. **[2 marks.]** The current through a 1 H inductor is shown at right. Select the appropriate sketch from the choices below for the inductor power $p_L(t)$.











(e) None of the above.