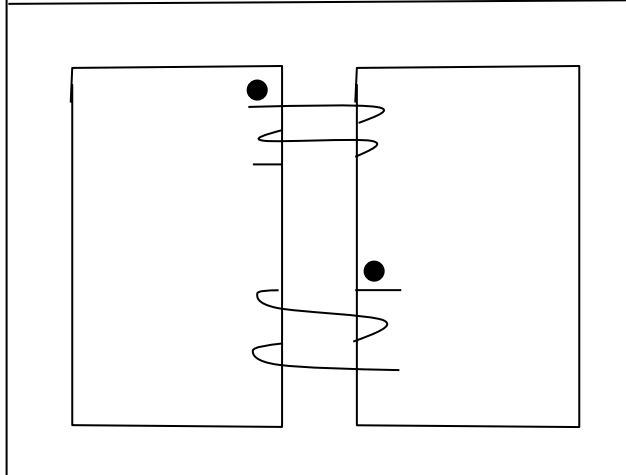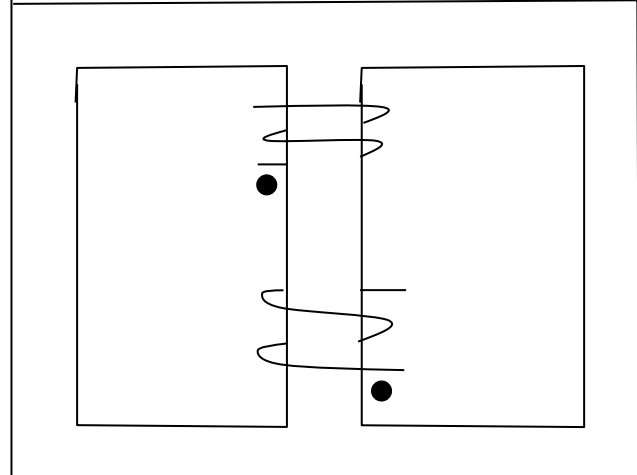**EE 303 Quiz 3, Feb 14, 2017, Dr. McCalley**

1. (30 pts) The physical construction of a pair of magnetically coupled coils is shown below. Assume that the magnetic flux is confined to the core material (no leakage). Show two possible locations for the dot markings on the pair of coils.
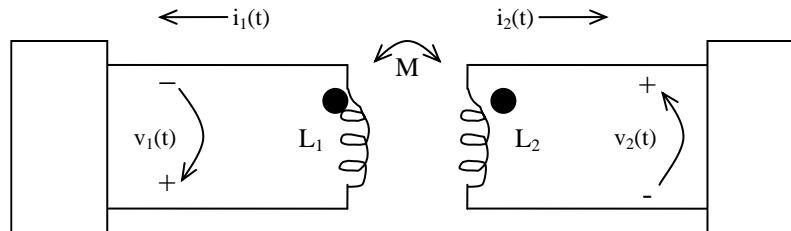

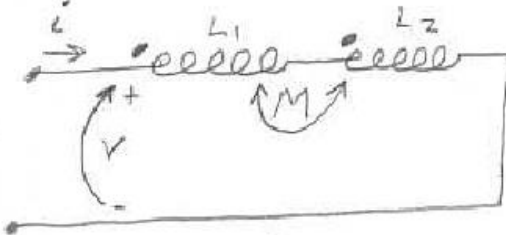**Location 1**   **Location 2**

2. (30 pts) Write the equations for $v_1(t)$ and $v_2(t)$ for the circuit below.

$$v_1(t) = L_1 \frac{di_1(t)}{dt} + M \frac{di_2(t)}{dt}; \qquad v_2(t) = -L_2 \frac{di_2(t)}{dt} - M \frac{di_1(t)}{dt}$$

3. (40 pts) A pair of coupled inductors is connected as shown below. Find the differential equation relating v(t) and i(t), and then find the equivalent inductance "seen" at the terminals looking into the circuit.

$$v(t) = L_1 \frac{di(t)}{dt} + M \frac{di(t)}{dt} + L_2 \frac{di(t)}{dt} + M \frac{di(t)}{dt} = \left[L_1 + 2M + L_2 \right] \frac{di(t)}{dt}$$

$$\Rightarrow L_{eq} = L_1 + 2M + L_2$$