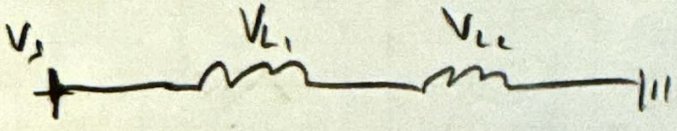
3) Inductance is defined as

$$V_L = L\frac{dI}{dt} \qquad L \to L_{total}$$

in series



$$V_s = V_{L_1} + V_{L_2}$$

$$V_s = L_1 \cdot \frac{dI}{dt} + L_2 \cdot \frac{dI}{dt}$$

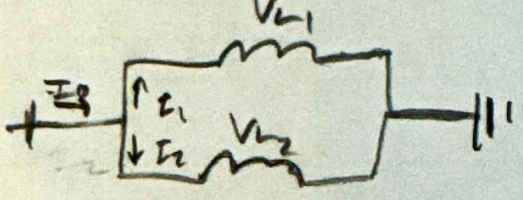
$$\frac{dI}{dt} L = \frac{dI}{dt}(L_1 + L_2)$$

$\frac{dI}{dt}$ = same for all inductors

→ Same current always running through the leg of the circuit

→ In series Inductors sum together

parallel case



$$V_s = V_{L_1} = L_1 \cdot \frac{dI_1}{dt}$$

$$V_s = V_{L_2} = L_2 \cdot \frac{dI_2}{dt}$$

$$\frac{V_s}{L_2} = \frac{dI_2}{dt} \qquad \frac{V_s}{L_1} = \frac{dI_1}{dt}$$

$$\frac{dI_0}{dt} = \frac{dI_1}{dt} + \frac{dI_2}{dt}$$

→

$$\frac{dI_0}{dt} = \frac{V_s}{L_2} + \frac{V_s}{L_1}$$

$$\frac{dI_0}{dt}_1 = \frac{V_s}{L}$$

$$\frac{1}{L} = \frac{1}{L_2} + \frac{1}{L_1}$$

- Inductors in parallel add together Inversely