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Lab 4: PreLab

a). When $V = 0$

$$V_{ab} = V_a - V_b = V_{R_1} - V_{R_3}$$

$$V_{Ra} = \frac{R_1}{R_1 + R_2} - \frac{R_3}{R_3 + R_x} = 0$$

$$R_1(R_3 + R_x) = R_2(R_1 + R_3)$$

$$2R_3$$

$$R_x = \frac{R_2 R_3}{R_1}$$

b). $\frac{Z_1}{Z_2} = \frac{Z_3}{Z_4}$

$$Z_1 = \frac{1}{j\omega C_1}, Z_2 = R_2, Z_3 = \frac{1}{j\omega C_3} + R_3, Z_4 = R_4 + j\omega L$$

$$\frac{\frac{1}{j\omega C_1}}{R_2} = \frac{\frac{1}{j\omega C_3} + R_3}{R_4 + j\omega L}$$

$$\Rightarrow \frac{1}{j\omega C_1 R_2} = \frac{1 + j\omega C_3 R_3}{j\omega C_3 R_4 - \omega^2 L C_3}$$

$$\Rightarrow j\omega C_3 R_4 - \omega^2 L C_3 = j\omega C_1 R_2 - \omega^2 C_1 C_3 R_2 R_3$$

$$\omega C_3 R_4 = \omega C_1 R_2$$

$$\Rightarrow C_3 R_4 = C_1 R_2$$

$$\omega^2 L C_3 = \omega^2 C_1 C_3 R_2 R_3$$

$$\Rightarrow L = C_1 R_2 R_3$$