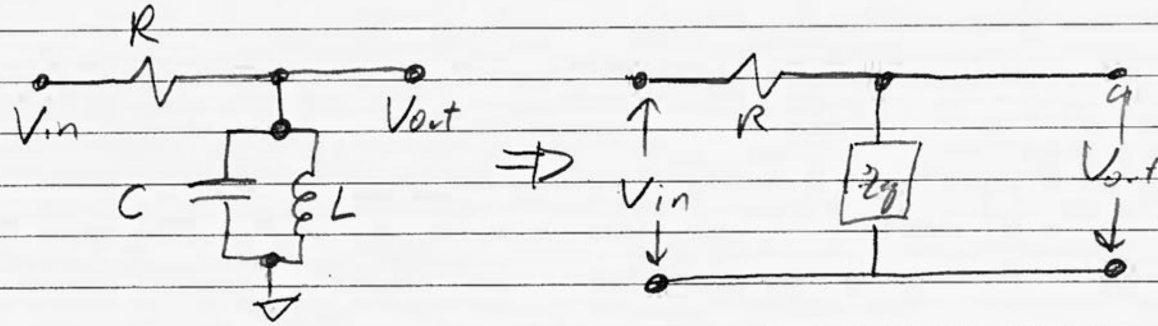
Notes on circuit 3.1 in laboratory #3 - Physics 120



$$\frac{V_{out}}{V_{in}} = \frac{Z_{eq}}{R + Z_{eq}} \; ; \; \text{But } Z_{eq} = \frac{\frac{1}{i\omega C}\, i\omega L}{\frac{1}{i\omega C} + i\omega L}$$

$$\text{"} = \frac{i\omega L}{1 - \omega^2 LC}$$

$$\text{"} \equiv R\,\frac{i\omega\tau}{1-(\omega/\omega_0)^2}$$

where $\tau = L/R$; $\omega_0 = 1/\sqrt{LC}$

$$\text{"} = \frac{i\omega\tau}{1-(\omega/\omega_0)^2} \cdot \frac{1}{1 + i\omega\tau/[1-(\omega/\omega_0)^2]}$$

$$\text{"} = \frac{i\omega\tau}{[1-(\omega/\omega_0)^2] + i\omega\tau}$$

$$\text{"} = \frac{i\omega\tau\{[1-(\omega/\omega_0)^2] - i\omega\tau\}}{[1-(\omega/\omega_0)^2]^2 + (\omega\tau)^2}$$

$$\text{"} = \omega\tau\,\frac{\omega\tau + i[1-(\omega/\omega_0)^2]}{(\omega\tau)^2 + [1-(\omega/\omega_0)^2]^2}$$

$$\left|\frac{V_{out}(\omega)}{V_{in}(\omega)}\right| = \frac{\omega\tau}{\sqrt{(\omega\tau)^2 + [1-(\omega/\omega_0)^2]^2}}$$