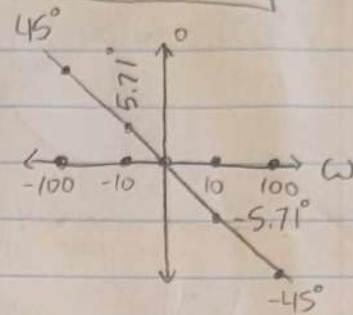
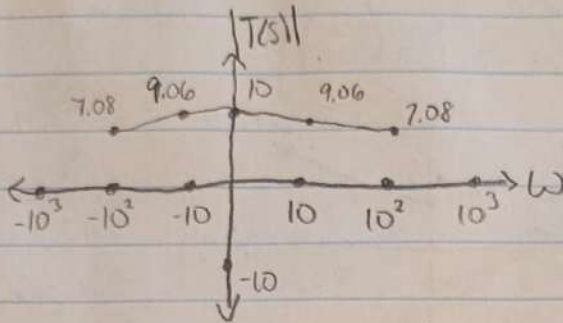


Homework 8

Gage Farmer
ECE 3020

$$a) Z_{RC} = \frac{R_2}{1 + sRC_2} = \frac{100k}{1 + s(100k)(0.1\mu)} = \frac{100k}{1 + 0.01s}$$

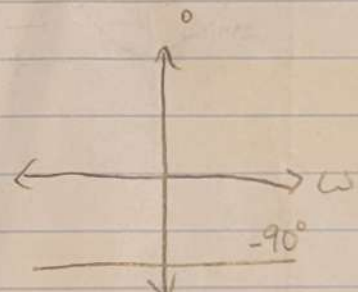
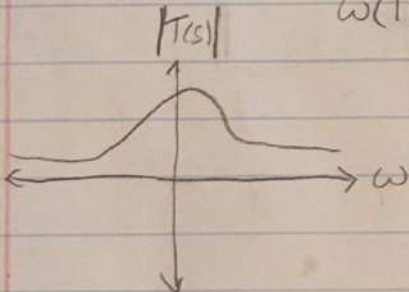
$$T(s) = \frac{Z_{RC}}{R_1} = \frac{-100k}{10k(1 + 0.01s)} = \frac{-10}{1 + 0.01s} = \frac{-10,000}{s + 100}$$



$$b) Z_{LC} = \frac{1}{sC_1} \parallel sL_1 = \frac{\frac{1}{sC_1} \cdot sL_1}{\frac{1}{sC_1} + sL_1} = \frac{sL_1}{1 + s^2C_1L_1}$$

$$T(s) = \frac{R_1(1 + (j\omega)^2L_1C_1)}{j\omega L_1} = \frac{R_1(1 - \omega^2L_1C_1)}{j\omega L_1}$$

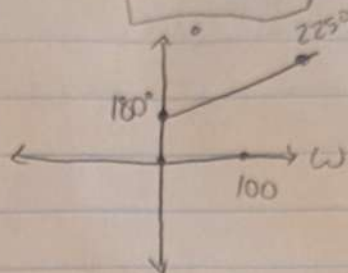
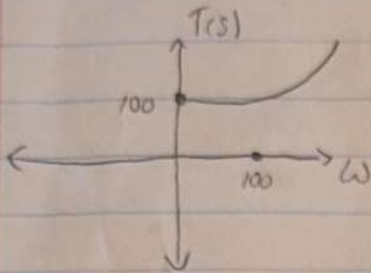
$$= \frac{10k(1 - \omega^2(1n)(1\mu))}{\omega(1n)} = \frac{10k - 1\omega^2}{1n\omega}$$



$$c) Z_{RC} = R_1 // \frac{1}{sC_1} = \frac{R_1}{1 + R_1 s C_1}$$

$$\frac{V_o}{V_s} = \frac{-R_2(1 + R_1 s C_1)}{R_1} = \frac{-100k(1 + (10k) s (1\mu))}{10k} = -10(1 + 10ms) = -(s + 100)$$

$$T(s) = |j\omega + 100| = \sqrt{(100)^2 + \omega^2} = \boxed{\tan^{-1}\left(\frac{\omega}{100}\right)}$$



$$d) Z_{LC} = \frac{1}{sC_2} // sL_2 = \frac{sL_2}{1 + sL_2C_2} = \frac{s(1\mu)}{1 + s(1\mu)(0.1\mu)} = \frac{s}{0.1\mu(s + \frac{1}{0.1\mu^2})}$$

$$T(s) = \frac{\omega}{\sqrt{(0.1\mu\omega)^2 + (10^6)^2}} = \boxed{90^\circ - \tan^{-1}\left(\frac{\omega}{0.1\mu}\right)}$$

