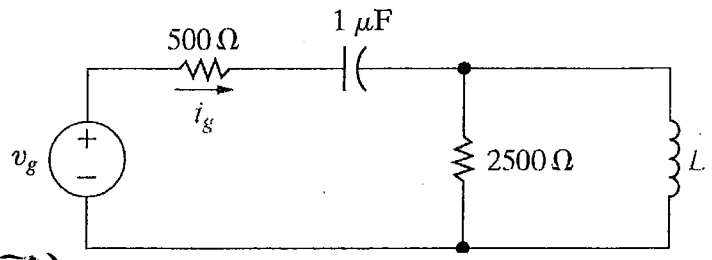
3. For the circuit to the right, $V_g = 20\cos(2000t)$.



a) If L= 1.25 H, what is the complex power absorbed by the load (R and L in parallel)? (12)

$Z_L = j\omega L = j(2000)(1.25) = j2500$

$Z_C = \frac{-j}{\omega C} = \frac{-j}{(2000)(10^{-6})} = -j500$

$Z_{R\|L} = \frac{(2500)(j2500)}{2500 + j2500} = \frac{(2500)^2\angle 90}{2500\sqrt{2}\angle 45} = \frac{2500}{\sqrt{2}}\angle 45 = 1250 + j1250$

$I_{LOAD} = \frac{V_g}{Z_{total}} = \frac{20}{(500 - j500) + 1250 + j1250} = \frac{20}{1750 + j750}$

$= \frac{20\angle 0}{1904\angle 23.2} = 0.0105\angle -23.2$

$S = \frac{|I|^2}{2} Z_{LOAD} = \frac{(0.0105)^2}{2}(1250 + j1250) = \underline{0.0689 + j0.689\ VA}$

$= 0.0974\angle 45°\ VA$

b) What value of L would maximize power transfer to the load? (8)

Norton transformation of source $I_N = (V_G)/(Z_{Th}) = \frac{20\angle 0}{500\sqrt{2}\angle -45°}$

$Y_N = \frac{1}{Z_{Th}} = \frac{1}{500 - j500} = \frac{1}{500\sqrt{2}\angle -45°} = \frac{\sqrt{2}}{1000}\angle 45 = 0.0283\angle 45°\ A$

$= \frac{1}{1000}(1 + j) =$ $Y_{LOAD} = \frac{1}{R} + \frac{1}{j\omega L} = \frac{1}{R} - \frac{j}{\omega L}$

$P = \frac{|I_R|^2 R}{2}$ $|I_R| = \left|\frac{Y_R}{G + jB_L + Y_N}\right|$ max when $jB_L = -jB_N$

To maximize P, maximize $|I_R|$ End of Exam $\frac{1}{\omega L} = \frac{1}{1000} \Rightarrow \underline{L = 0.5}$