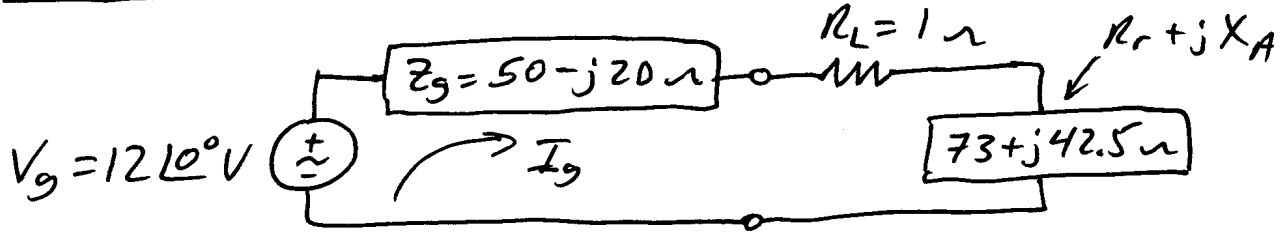
2.53 A λ/2 dipole, with a total loss resistance of 1 ohm, is connected to a generator whose internal impedance is 50 + *j*25 ohms. Assuming that the peak voltage of the generator is 2 V and the impedance of the dipole, excluding the loss resistance, is 73 + *j*42.5 ohms, find the power

(a) supplied by the source (real) (b) radiated by the antenna

(c) dissipated by the antenna

- Make **generator** peak voltage 12 V and impedance of 50 - *j* 20 Ω. [Hint: Look at Chapter 4 section on λ/2 dipoles.]
- Per (4-93a), $\boldsymbol{Z_{in} = 73 + j\,42.5\ \Omega}$ for a lossless λ/2 dipole.

Equivalent circuit



$$I_g = \frac{V_g}{Z_{eq}} = \frac{12\angle 0°}{(50 - j20) + 1 + 73 + j42.5}$$

$$= 0.09521935\angle -10.2845°\ A$$

a) $P_{source} = \frac{1}{2}\,\mathrm{Re}\{V_g I_g^*\} = \frac{1}{2}\,\mathrm{Re}\{12\angle 0°\,(0.0952\angle +10.28°)\}$

$$= \frac{1}{2}\,\mathrm{Re}\{1.1243 + j0.204\}$$

$$P_{source} = 0.5621\ W$$

b) $P_{rad} = \frac{1}{2}|I_g|^2 R_r = \frac{1}{2}(0.09521935)^2\,73$

$$P_{rad} = 0.3309\ W$$

c) $P_{loss} = \frac{1}{2}|I_g|^2 R_L = \frac{1}{2}(0.09521935)^2\,1$

$$P_{loss} = 4.533\ mW$$