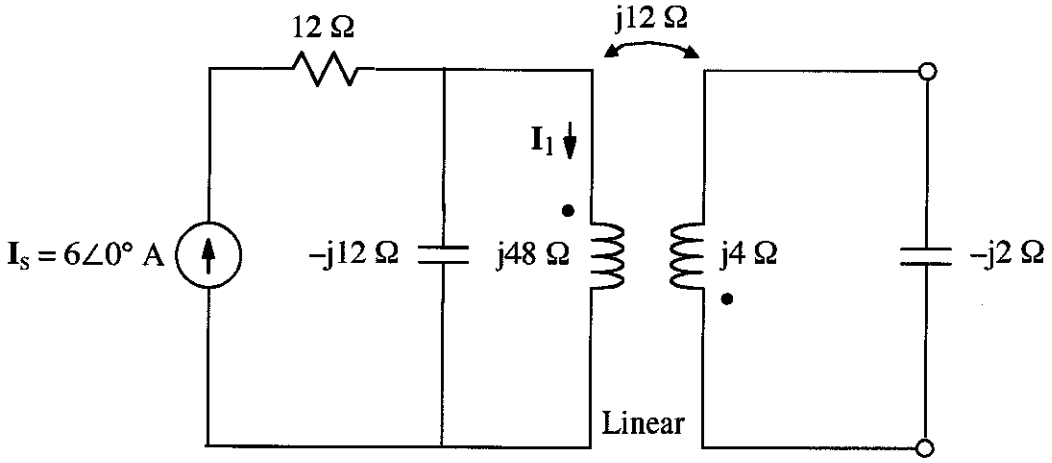
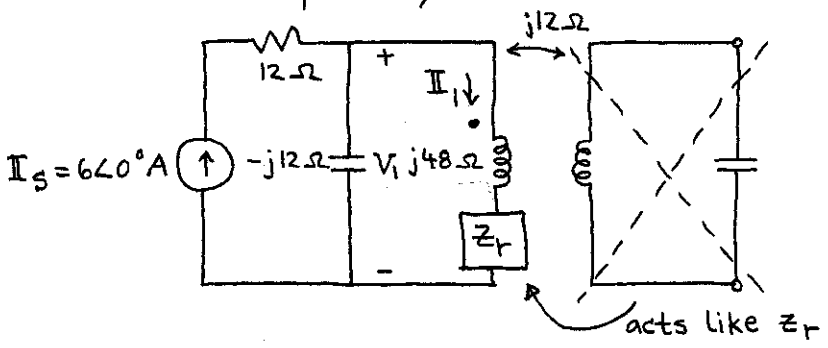
EX:



Calculate the numerical value of phasor current $\mathbf{I}_1$.

Soln: We first replace the secondary with the equivalent reflected impedance, z_r, seen on the primary side.



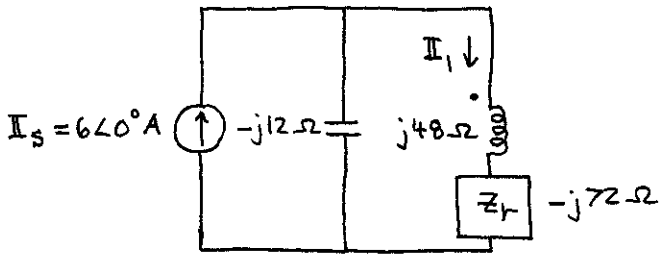
Note: V_1 includes the voltage drop across z_r.

We have

$$z_r = \frac{(\omega M)^2}{z_{secondary}} = \frac{12^2\ \Omega^2}{j4 - j2\ \Omega}$$

$$z_r = \frac{144}{j2}\Omega = -j72\ \Omega$$

Since the 12Ω resistor is in series with a current source, it carries the same current as the source and, therefore, may be ignored. We are left with a current divider circuit.



$$\mathbb{I}_1 = \mathbb{I}_S \cdot \frac{-j12\,\Omega}{-j12 + j48 - j72\,\Omega}$$

$$= \mathbb{I}_S \frac{-j12}{-j36}$$

$$= \frac{\mathbb{I}_S}{3} = \frac{6\angle 0°\,A}{3}$$

$$\mathbb{I}_1 = 2\angle 0°\,A$$