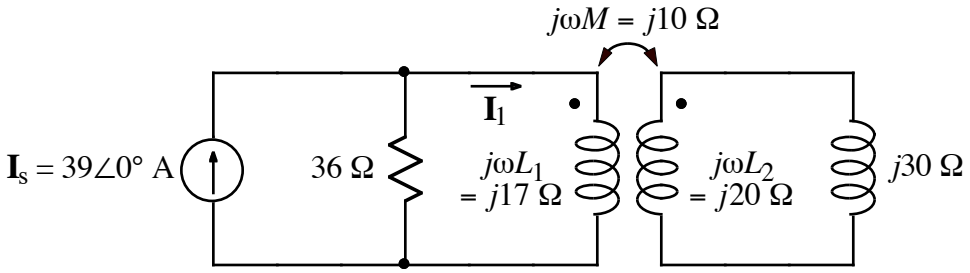
HOMEWORK #8 prob 4 solution

EX:



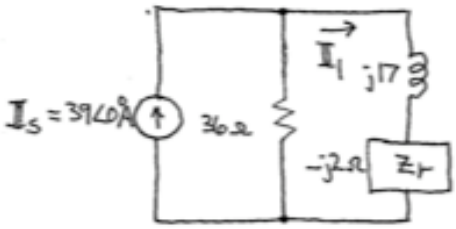
Calculate the numerical value of phasor current $\mathbf{I}_1$ for the above circuit. Note: the transformer is linear.

SOL'N:

Use $z_r = \dfrac{(\omega M)^2}{z_{secondary}} = \dfrac{10^2\,\Omega^2}{j20 + j30\,\Omega}$

$z_r = \dfrac{100\,\Omega^2}{j50\,\Omega} = -j2\,\Omega$

Equiv circuit:



This is a current divider.

$$\mathbb{I}_1 = \mathbb{I}_s \frac{36\,\Omega}{36\,\Omega + j17\,\Omega - j2\,\Omega}$$

$$= \mathbb{I}_s \frac{36\,\Omega}{36\,\Omega + j15\,\Omega} = \mathbb{I}_s \frac{12\,\Omega}{12\,\Omega + j5\,\Omega}$$

$$= \mathbb{I}_s \frac{12}{13\angle 22.6^\circ} = \frac{3}{39 \cdot 12} \text{ A}$$

$$\mathbb{I}_1 = 36\angle -22.6^\circ \text{ A}$$