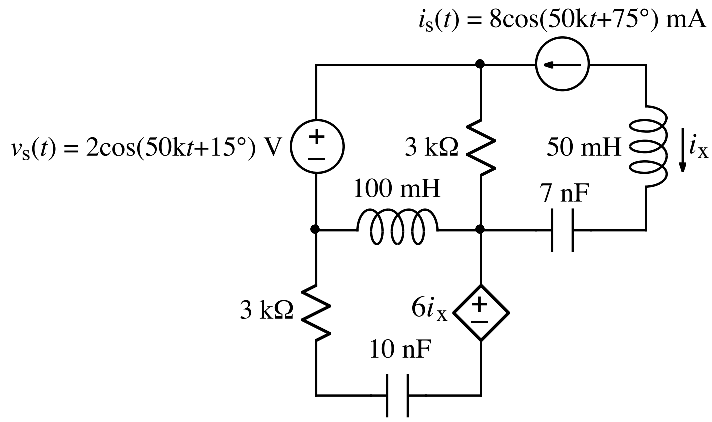
EX: Draw the frequency-domain circuit diagram (with numerical values for impedances and phasors [except the dependent source which will be labeled $6\mathbf{I}_x$]) for the following circuit:



SOL'N: In the frequency-domain, we use phasors for voltages and currents, and impedances for resistors, capacitors, and inductors.

The phasor transform is captured by the following equation:

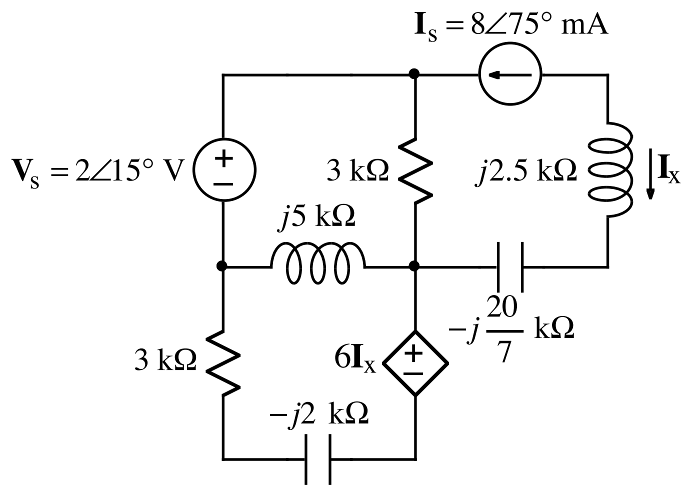
$$P[A\cos(\omega t + \phi)] = Ae^{j\phi} \equiv A\angle\phi$$

We apply this equation to v_s and i_s using the same units in the frequency-domain as in the time-domain. The circuit diagram, below, shows the values.

The impedances are calculated with the following formulas:

$$z_R = R \qquad z_L = j\omega L \qquad z_C = \frac{1}{j\omega C} = \frac{-j}{\omega C}$$

The values are shown on the circuit diagram below. We may save some effort by noting that doubling the value of L increases the impedance by a factor of two, whereas doubling the value of C decreases the impedance by a factor of two.


$\mathbf{I}_s = 8\angle 75°$ mA
$\mathbf{V}_s = 2\angle 15°$ V
3 kΩ
$j2.5$ kΩ
$\mathbf{I}_x$
$j5$ kΩ
$-j\dfrac{20}{7}$ kΩ
3 kΩ
$6\mathbf{I}_x$
$-j2$ kΩ