Ex: Find the total impedance of the circuitry shown below if $\omega = 1000$ rad/s.

![Circuit Diagram]

Sol’n: We convert to the frequency-domain by computing impedances.

$$j\omega L = j1k \cdot 250m \ \Omega = j250 \ k\Omega$$

$$\frac{1}{j\omega C} = \frac{1}{j1k \cdot 4\mu} \Omega = -j250 \ \Omega$$

$$j\omega L = j1k \cdot 100m \ \Omega = j100 \ k\Omega$$

$$\frac{1}{j\omega C} = \frac{1}{j1k \cdot 10\mu} \Omega = -j100 \ \Omega$$

The series $L$ and $C$ in series at the top left of the circuit sum to zero, which means they cancel out to act like a wire. The parallel $L$ and $C$ at the right combine to create an equivalent impedance of infinity, or an open circuit.

$$j100 \ || -j100 \ \Omega = j100 \ \Omega \cdot 1 \ || -1 = j100 \ \Omega \cdot \frac{1(-1)}{1-1} = j100 \ \Omega \cdot \frac{1}{0} = \infty \ \Omega$$

Thus, the $L$ and $C$ on the right disappear. We are left with a simple circuit consisting of only two resistors:
The equivalent impedance is obviously 10 kΩ.

\[ z_{\text{tot}} = 10 \text{kΩ} \]