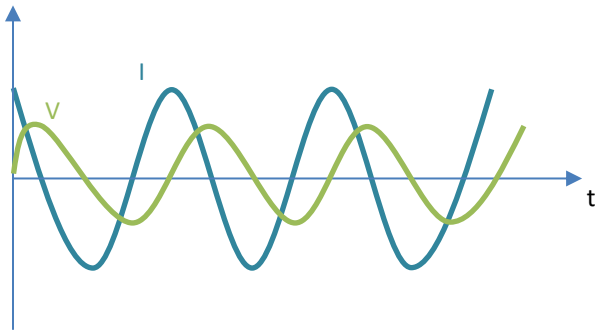
CONCEPT: CAPACITORS IN AC CIRCUITS

- The current in an AC circuit at any time is
  - $i(t) =$ _____
- Remember! The voltage across a capacitor is $v_C =$ _____
  - Using calculus, one can show $q(t) = \frac{i_{MAX}}{\omega}\cos\left(\omega t - \frac{\pi}{2}\right)$

- The VOLTAGE ACROSS A CAPACITOR in an AC circuit is
  - $v_C(t) =$ _____

- This means, if current and voltage across the capacitor are plotted, the voltage of a capacitor LAGS the current by 90°:



- The MAXIMUM voltage across the capacitor is $V_C =$ _____
  - This result looks A LOT like Ohm's Law, if we have some resistance-like quantity $1/\omega C$

→ We define the CAPACITIVE REACTANCE as $\boldsymbol{X_C = 1/\omega C}$

EXAMPLE: An AC power source delivers a maximum voltage of 120 V at 60 Hz. What is the maximum current in a circuit with this power source connected to a 100 μF capacitor?

PRACTICE: MAXIMUM CHARGE IN A CAPACITOR AC CIRCUIT

An AC source operates at a maximum voltage of 120 V and a frequency of 60 Hz. If it is connected to a 175 μF capacitor, what is the maximum charge stored on the capacitor?

EXAMPLE: CURRENT IN A PARALLEL RC AC CIRCUIT

An AC source operating at 160 s^{-1} and a maximum voltage of 15 V is connected in parallel to a 5 Ω resistor and in parallel to a 1.5 mF capacitor. What is the RMS current through the capacitor?

PRACTICE: OSCILLATION FREQUENCY OF A CAPCITOR CIRCUIT

A 300 μF capacitor is connected to an AC source operating at an RMS voltage of 120 V. If the maximum current in the circuit is 1.5 A, what is the oscillation frequency of the AC source?