Expression of relation of capacitance with voltage and charge

$$C = \frac{q}{v_c}$$

Derivation for expression of voltage in capacitor in ac

$$i = \frac{dq}{dt} = I \cos(\omega t)$$

$$\text{Integrating },$$

$$\int dq = \int I \cos(\omega t) dt$$

$$q = \frac{I}{\omega} \sin \omega t$$

$$v_c = \frac{q}{C}$$

$$v_c = \frac{I}{\omega C} \sin \omega t$$

Expression of voltage in capacitance in terms of sine in ac

$$v_C = \frac{I}{\omega C} \sin \omega t$$

Expression of voltage in capacitance in terms of cosine in ac

$$v_C = \frac{I}{\omega C} \cos \omega t - 90°$$

Phase angle of voltage in capacitance in ac

- 90

Expression of capacitive reactance in ac

$$X_C = \frac{1}{\omega C}$$

SI unit of capacitive reactance

Ohm

Graph of voltage and current versus time in capacitor in ac

[Illustration Missing]

Crests and trough of current and voltage are at different positions from the x axis

Phasor diagram of voltage and current in capacitor in ac

[Illustration Missing]

Current is at positive while voltage at negative