Resistors

$$\boxed{V_R = I R}$$

equation

symbol

$R = [\Omega] = [\text{ohms}]$

$[\Omega] = \left[\frac{kg\ m^2}{amp^2\ s^3}\right]$

units

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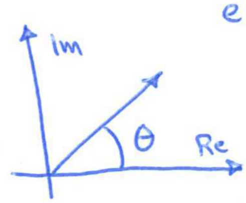
if $I(t) = I_p \sin(\omega t - \phi_I)$

then: $$\boxed{V_R = R I_p \sin(\omega t - \phi_I)}$$

in time domain V_R is in phase with current.

$e^{i\theta} = \cos\theta + i\sin\theta$



$e^{i\theta} = \cos\theta + i\sin\theta$

so: $Re(e^{i\theta}) = \cos\theta$

$Im(e^{i\theta}) = \sin\theta$

move to complex plane:

$$V_R = Im\left(R I_p e^{i(\omega t - \phi_I)}\right)$$

$x^{m+n} = x^m x^n$

$$= Im\left(R I_p e^{i\omega t} e^{-i\phi_I}\right)$$

$$= Im\left(R I_p e^{-i\phi_I} e^{i\omega t}\right)$$

phasors

move to phasor reference frame:

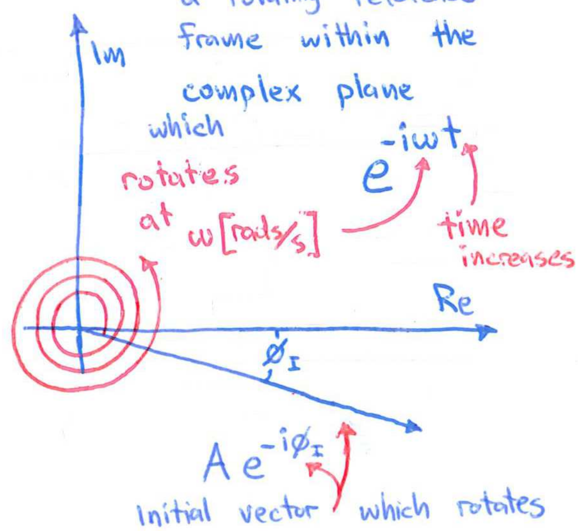
$$Im\left(\tilde{V}_R e^{i\omega t}\right) = Im\left(R \tilde{I} e^{i\omega t}\right)$$

rotating reference frame

where: $\tilde{V}_R = V_{R,p} e^{-i\phi_V}$ & $\tilde{I} = I_p e^{-i\phi_I}$

Phasors:

a rotating reference frame within the complex plane



seperate phasor part:

$$\tilde{V}_R = R \tilde{I}$$

$$\boxed{\tilde{V}_R = Z_R \tilde{I}} \quad \text{where} \quad \boxed{Z_R = R}$$

in phase domain Z_R is Real