Kirchhoff: generator voltage
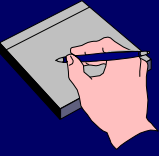
- Instantaneous voltage across generator (V_{gen}) must equal sum of voltage across all of the elements at all times:
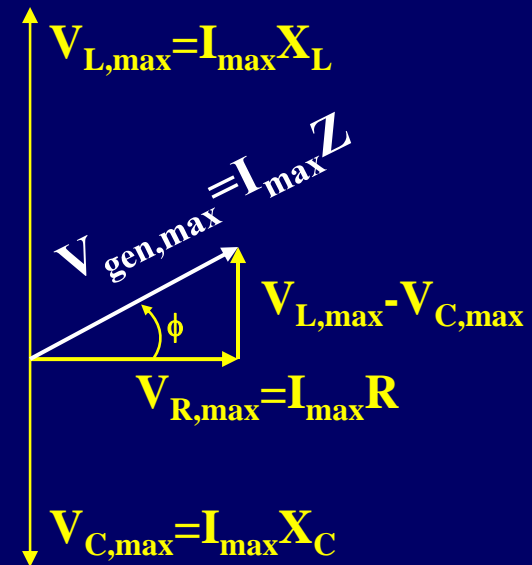
$$V_{gen}(t) = V_R(t) + V_C(t) + V_L(t)$$

$$V_{gen,max} = \sqrt{V_{R,max}^2 + (V_{L,max} - V_{C,max})^2}$$

$$\tan\phi = \frac{V_{L,max} - V_{C,max}}{V_{R,max}}$$

"phase angle"

Define <u>impedance</u> Z: $V_{gen,max} \equiv I_{max} Z$

$$Z = \sqrt{R^2 + (X_L - X_C)^2} \qquad \tan(\phi) = \frac{(X_L - X_C)}{R}$$

$V_{L,max} = I_{max} X_L$

$V_{gen,max} = I_{max} Z$

$V_{L,max} - V_{C,max}$

$V_{R,max} = I_{max} R$

$V_{C,max} = I_{max} X_C$

"Impedance Triangle"