AC Source	
Time Domain Function	Phasor Format
$v(t)=V_M\times\sin(\omega t+\theta_v)^{(V)}$	$V_M\angle\theta$

Symbol	Designates
V_M	Magnitude/Amplitude
ω	Angular Frequency
t	Instantaneous Time
θ	Phase Angle
$^{(V)}$	Measurement in Volts

Instantaneous Value Of A Sine Wave	
Degree Approach	Radian Approach
$v=V_{Pk}\times\sin(\theta)$	$v=V_{Pk}\times\sin(\omega t)$
Note: Make sure calculator is in appropriate mode.	

Degrees	Radians
$\deg=\text{rad}\cdot\frac{180}{\pi}$	$\text{rad}=\deg\cdot\frac{\pi}{180}$

Sine Wave Magnitude Conversions				
	P-P×	Pk×	rms×	ave×
P-P =	1.0	2.0	2.828	3.14
Pk =	0.5	1.0	1.414	1.57
rms =	0.3535	0.707	1.0	1.11
ave =	0.3185	0.637	0.9	1.0
Largest ← P-P Pk rms ave → Smallest				

Cycle Time (Period)/ Frequency	
$T=\frac{1}{f}$	Cycle Time
$f=\frac{1}{T}$	Frequency

Angular Frequency
$\omega=2\times\pi\times f$

Time Domain / Phasor Format Conversion	
$[v(t)=V_M\times\sin(\omega t\pm\theta)]=[V_S=V_{RMS}\angle\theta]$	
$V_M=\sqrt{2}\times V_S$	Magnitude
$V_{RMS}=\frac{V_{PK}}{\sqrt{2}}$	Magnitude

Phase / Time	
$\frac{\theta}{360°}=\frac{t}{T_C}$	Relationship
$\theta=360°\times\frac{t}{T_C}$	Phase Angle
$t=T_C\times\frac{\theta}{360°}$	Instantaneous Time
$T_C=t\times\frac{360°}{\theta}$	Cycle Time (Period)
$360°=\theta\times\frac{T_C}{t}$	Complete Cycle

	Resistors	Inductors	Capacitors
f =	v = i	v = i	v = i
f_r =	☒	$\frac{1}{2\times\pi\times\sqrt{LC}}$	
θ_v =	θ_i	$\theta_i+90°$	$\theta_i-90°$
θ_i =	θ_v	$\theta_v-90°$	$\theta_v+90°$
X =	☒	$\omega\times L$	$\frac{1}{\omega\times C}$
Z =	$R\angle 0°$	$X_L\angle+90°$	$X_C\angle-90°$
Y =	$\frac{1}{R}$	$\frac{1}{Z_L}$	$\frac{1}{Z_C}$

Ohm's Law		
$E=IR$	$I=P/E$	$R=E/I$
$E=P/I$	$I=E/R$	$R=E^2/P$
$E=\sqrt{PR}$	$I=\sqrt{P/R}$	$R=P/I^2$

Watt's Law		
DC	AC	
$P=EI$	$P_R=\lvert V_T\rvert\times\lvert I_T\rvert\times\cos(\theta_Z)^{(W)}$	Resistive (True Power)
$P=I^2R$	$P=P_X=\lvert V_T\rvert\times\lvert I_T\rvert\times\sin(\theta_Z)^{(VAR)}$	Reactive
$P=E^2/R$	$S=P_{APP}=\lvert V_T\rvert\times\lvert I_T\rvert^{(VA)}$	Apparent (Virtual Power)

Power Factor	Quality
$PF=\frac{P_R}{P_{APP}}$	$Q=\frac{P_X}{P_R}$
$PF=\cos(\theta_Z)$	← Q → Low Quality ≤10> High Quality

Series Circuits		
V_T	$V_1+V_2+K+V_n$	
V_n	$V_S\times(\frac{R_n}{R_T})$	
I_T	$I_1=I_2=I_n$	
R_T	$R_1+R_2+K+R_n$	
Z_T	$Z_1+Z_2+K+Z_n$	$\frac{1}{Y_T}$
Y_T	$\frac{1}{Z_T}$	$Y_1+Y_2+KY_n$
P_T	$P_1+P_2+K+P_n$	

Parallel Circuits				
V_T	$V_1=V_2=V_n$			
I_T	$I_1+I_2+K+I_n$			
I_n	$I_S\times(R_T/R_n)$			
	All Ckts	2 Branch	Equal R	Y_T
R_T	$\frac{1}{\frac{1}{R_1}+\frac{1}{R_2}+K+\frac{1}{R_n}}$	$\frac{R_1R_2}{R_1+R_2}$	$\frac{R_1}{R_n}$	☒
Z_T	$\frac{1}{\frac{1}{Z_1}+\frac{1}{Z_2}+K+\frac{1}{Z_n}}$	$\frac{Z_1Z_2}{Z_1+Z_2}$	$\frac{Z_1}{Z_n}$	$\frac{1}{Y_T}$
Y_T	$\frac{1}{Z_T}$	$Y_1+Y_2+KY_n$		
P_T	$P_1+P_2+K+P_n$			

Transformers			
Voltage		Current	
$\frac{N_P}{N_S}=\frac{V_P}{V_S}$	Turn Ratio	$\frac{N_P}{N_S}=\frac{I_S}{I_P}$	Turn Ratio
$V_P=V_S\frac{N_P}{N_S}$	Primary Voltage	$I_P=I_S\frac{N_S}{N_P}$	Primary Current
$V_S=V_P\frac{N_S}{N_P}$	Secondary Voltage	$I_S=I_P\frac{N_P}{N_S}$	Secondary Current
Impedance			
$Z_P=Z_S\left(\frac{N_P}{N_S}\right)^2$	Primary Impedance	$Z_S=Z_P\left(\frac{N_S}{N_P}\right)^2$	Secondary Impedance

© 2011 m4yh3m @ http://www.allaboutcircuits.com