

Phasor Transform

Definition

$$\underline{F} = \frac{1}{\pi} \int_0^{2\pi} f(\omega_0 t) e^{-j\omega_0 t} d(\omega_0 t) = \frac{1}{\pi} \int_0^{2\pi} f(\omega_0 t) (\cos(\omega_0 t) - j \sin(\omega_0 t)) d(\omega_0 t)$$
$$f(\omega_0 t) = \Re(\underline{F} e^{j\omega_0 t}) = \Re(\underline{F} (\cos(\omega_0 t) + j \sin(\omega_0 t)))$$

Phasor Transform, Complete Table

time-domain	phasor-domain	comment
$\cos(\omega_0 t)$	1	cosine function
$\sin(\omega_0 t)$	$-j$	sine function
$f(t)$	\underline{F}	a function of the class $A \sin(\omega_0 t) + B \cos(\omega_0 t)$, $A, B \in \mathbb{R}$
$g(t)$	\underline{G}	another function of the class $A \sin(\omega_0 t) + B \cos(\omega_0 t)$
$f(t) + g(t)$	$\underline{F} + \underline{G}$	additivity
$a f(t)$	$a \underline{F}$	homogeneity, $a \in \mathbb{R}$
$A \cos(\omega_0 t) + B \sin(\omega_0 t)$	$A - j B$	transform in a general case
$\frac{d}{dt}, D$	$j \omega_0$	differentiation over time reduces to multiplying by $j \omega_0$

Phasor Transform, Reduced Table

time-domain	phasor-domain
$A \cos(\omega_0 t) + B \sin(\omega_0 t)$	$A - j B$
$\frac{d}{dt}, D$	$j \omega_0$