

rechnung_betragundphase_umkehrintegrator

Student Group

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$U_A = -\frac{1}{R} \int_{t_0}^{t_1} \frac{d}{dt} U_E(t) dt + U_{A0}$	insert sine function	$U_E(t) = \hat{U}_E \sin(\omega t)$
$U_A = -\frac{1}{R} \int_{t_0}^{t_1} \sin(\omega t) dt + U_{A0}$	insert root function with limits	$\int \sin(ax) dx = -\frac{1}{a} \cos(ax)$
$U_A = -\frac{1}{R} \int_{t_0}^{t_1} \cos(\omega t) dt + U_{A0}$	put constant before integral	
$U_A = \frac{1}{\omega R} [\sin(\omega t_1) - \sin(\omega t_0)] + U_{A0}$	insert limits	$t_0=0, t_1=t$
$U_A = \frac{1}{\omega R} \cos(\omega t_0) - \frac{1}{\omega R} \cos(\omega t_1) + U_{A0}$	$\cos(0) = 1$	
$U_A = \frac{1}{\omega R} [\cos(\omega t_0) - \cos(\omega t_1)] + U_{A0}$	multiply	
$U_A = \frac{1}{\omega R} [\cos(\omega t_0) - \cos(\omega t_1)] + U_{A0}$	consider the non-cosine terms	
$U_A = \frac{1}{\omega R} [\cos(\omega t_0) - \cos(\omega t_1)] + U_{A0}$	This part is independent in time. Since we assume purely sinusoidal quantities, the for the initial voltage of the capacitor must be:	$U_{A0} = \hat{U}_E \cos(\omega t_0)$
$U_A = \frac{1}{\omega R} [\cos(\omega t_0) - \cos(\omega t_1)] + U_{A0}$		
$U_A = \frac{1}{\omega R} [\cos(\omega t_0) - \cos(\omega t_1)] + U_{A0}$		

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