

rechnung_betragundphase_umkehrintegrator

Student Group

First Name	Surname	Matrikel Nr.

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$U_A = -\frac{1}{R \cdot C} \int_{t_0}^{t_1} U_E(t) dt + U_{A0}$	insert sine function	$U_E(t) = \hat{U}_E \sin(\omega \cdot t)$
$U_A = -\frac{1}{R \cdot C} \int_{t_0}^{t_1} \hat{U}_E \sin(\omega \cdot t) dt + U_{A0}$	insert root function with \limits	$\int \sin(a \cdot x) dx = -\frac{1}{a} \cos(a \cdot x)$
$U_A = -\frac{1}{R \cdot C} \hat{U}_E \left[-\frac{1}{\omega} \cos(\omega \cdot t) \right]_{t_0}^{t_1} + U_{A0}$	put constant before \ integral	
$U_A = \frac{1}{R \cdot C} \hat{U}_E \left[\cos(\omega \cdot t) \right]_{t_0}^{t_1} + U_{A0}$	insert limits	$t_0=0, t_1=t$
$U_A = \frac{\hat{U}_E}{R \cdot C} \left[\cos(\omega \cdot t) - \cos(\omega \cdot 0) \right] + U_{A0}$		$\cos(0) = 1$
$U_A = \frac{\hat{U}_E}{R \cdot C} \left[\cos(\omega \cdot t) - 1 \right] + U_{A0}$	multiply	
$U_A = \frac{\hat{U}_E}{R \cdot C} \left[\cos(\omega \cdot t) - 1 \right] + U_{A0}$	consider the \non-cosine terms	
$U_A = \frac{\hat{U}_E}{R \cdot C} \left[\cos(\omega \cdot t) - 1 \right] + U_{A0}$	This part is independent in time. Since we assume purely sinusoidal quantities, the for the initial voltage of the capacitor must be:	$U_{C0} = U_{A0} = \frac{\hat{U}_E}{R \cdot C}$
$U_A = \frac{\hat{U}_E}{R \cdot C} \left[\cos(\omega \cdot t) - 1 \right] + U_{A0}$		
$U_A = \frac{\hat{U}_E}{R \cdot C} \left[\cos(\omega \cdot t) - 1 \right] + U_{A0}$		

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