

rechnung_betragundphase_umkehrintegrator

Student Group

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

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