

# rechnung\_umkehrintegrator

## Student Group

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$U_A = f(U_E)$		
with III.		
$U_A = \color{blue}{U_D} - U_C$		
with II. and I.	$\color{blue}{U_D} = \frac{1}{A \cdot D} \cdot U_A \xrightarrow{\infty} 0$	
$U_A = 0 - \color{blue}{U_C}$		
with V.	$\color{blue}{U_C} = \frac{1}{C} \cdot \int_{t_0}^{t_1} I_C \, dt + Q_0(t_0)$	
$U_A = -\frac{1}{C} \cdot \int_{t_0}^{t_1} I_C \, dt + Q_0(t_0)$		
with IV.	$\color{blue}{I_C} = I_R$	
$U_A = \color{blue}{I_R} \cdot \int_{t_0}^{t_1} \frac{1}{C} \, dt + Q_0(t_0)$		
Factor out		
$U_A = -\frac{1}{C} \cdot \int_{t_0}^{t_1} I_R \, dt - \color{blue}{\frac{Q_0(t_0)}{C}}$		
consider the integration constant	$\color{blue}{\frac{Q_0(t_0)}{C}} = -U_{A0}$	
$U_A = -\frac{1}{C} \cdot \int_{t_0}^{t_1} I_R \, dt + U_{A0}$		
with VI. and II.	$\color{blue}{I_R} = \frac{U_R}{R} = \frac{U_E}{R}$	
$U_A = -\frac{1}{C} \cdot \int_{t_0}^{t_1} \frac{U_E}{R} \, dt + U_{A0}$		
move constant ahead		
$U_A = -\frac{1}{R \cdot C} \cdot \int_{t_0}^{t_1} U_E \, dt + U_{A0}$		
insert time constant		
$\tau = R \cdot C$		
$U_A = -\frac{1}{\tau} \cdot \int_{t_0}^{t_1} U_E \, dt + U_{A0}$		

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