

# 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.: $\color{blue}{U_D} = \{ 1 \over A_D \} \cdot U_A \overset{A_D \rightarrow}{\infty} \rightarrow 0$
$U_A = \color{blue}{0} - \color{blue}{U_C}$
with V.: $\color{blue}{U_C} = \{ 1 \over C \} \cdot (\int_{t_0}^{t_1} I_C \, dt + Q_0(t_0))$
$U_A = -\{ 1 \over C \} \cdot (\int_{t_0}^{t_1} \color{blue}{I_C} \, dt + Q_0(t_0))$
with IV.: $\color{blue}{I_C} = I_R$
$U_A = \color{blue}{-\{ 1 \over C \} \cdot (\int_{t_0}^{t_1} I_R \, dt + Q_0(t_0))}$
Factor out
$U_A = -\{ 1 \over C \} \cdot \int_{t_0}^{t_1} I_R \, dt - \color{blue}{\{ Q_0(t_0) \over C \}}$
consider the integration constant: $\color{blue}{\{ Q_0(t_0) \over C \}} = U_C(t_0) = -U_{A0}$
$U_A = -\{ 1 \over C \} \cdot \int_{t_0}^{t_1} \color{blue}{I_R} \, dt + U_{A0}$
with VI. and II.: $\color{blue}{I_R} = \{ U_R \over R \} = \{ U_E \over R \}$
$U_A = -\{ 1 \over C \} \cdot \int_{t_0}^{t_1} \color{blue}{\{ 1 \over R \} \cdot U_E} \, dt + U_{A0}$
move constant ahead
$U_A = -\{ 1 \over \{ R \cdot C \} \} \cdot \int_{t_0}^{t_1} U_E \, dt + U_{A0}$
insert time constant $\tau = R \cdot C$
$U_A = -\{ 1 \over \tau \} \cdot \int_{t_0}^{t_1} U_E \, dt + U_{A0}$

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