

rechnung_umkehrintegrator

Student Group

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

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