rechnung_umkehrintegrator

Student Group

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