

# rechnung\_betragundphase\_umkehrintegrator

## Student Group

First Name	Surname	Matrikel Nr.

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\$\;\$ \$\;\$ \$\;\$	$U_{\text{O}} = -\frac{1}{R \cdot C} \int_{t_0}^{t_1} U_{\text{I}}(t) \, dt + U_{\text{O0}}$
\$\;\$ \$\;\$ \$\;\$	insert sine function: $U_{\text{I}}(t) = \hat{U}_{\text{I}} \cdot \sin(\omega \cdot t)$
\$\;\$ \$\;\$ \$\;\$	$U_{\text{O}} = -\frac{1}{R \cdot C} \int_{t_0}^{t_1} \hat{U}_{\text{I}} \cdot \sin(\omega \cdot t) \, dt + U_{\text{O0}}$
\$\;\$ \$\;\$ \$\;\$	insert root function with limits $\int_{x_0}^{x_1} \sin(a \cdot x) \, dx = \left[ -\frac{1}{a} \cdot \cos(a \cdot x) \right]_{x_0}^{x_1}$
\$\;\$ \$\;\$ \$\;\$	$U_{\text{O}} = -\frac{1}{R \cdot C} \cdot \left[ -\frac{\hat{U}_{\text{I}}}{\omega} \cdot \cos(\omega \cdot t) \right]_{t_0}^{t_1} + U_{\text{O0}}$
\$\;\$ \$\;\$ \$\;\$	put constant before integral $U_{\text{O}} = \frac{1}{R \cdot C} \cdot \left[ \frac{\hat{U}_{\text{I}}}{\omega} \cdot \cos(\omega \cdot t) \right]_{t_0}^{t_1} + U_{\text{O0}}$
\$\;\$ \$\;\$ \$\;\$	insert limits: $t_0=0$ , $t_1=t$ $U_{\text{O}} = \frac{\hat{U}_{\text{I}}}{\omega \cdot R \cdot C} \cdot (\cos(\omega \cdot t) - \cos(0)) + U_{\text{O0}}$
\$\;\$ \$\;\$ \$\;\$	$\cos(0) = 1$
\$\;\$ \$\;\$ \$\;\$	$U_{\text{O}} = \frac{\hat{U}_{\text{I}}}{\omega \cdot R \cdot C} \cdot (\cos(\omega \cdot t) - 1) + U_{\text{O0}}$
\$\;\$ \$\;\$ \$\;\$	multiply $U_{\text{O}} = \frac{\hat{U}_{\text{I}}}{\omega \cdot R \cdot C} \cdot \cos(\omega \cdot t) - \frac{\hat{U}_{\text{I}}}{\omega \cdot R \cdot C} + U_{\text{O0}}$
\$\;\$ \$\;\$ \$\;\$	consider the non-cosine terms: The blue part is independent in time. We assume purely sinusoidal quantities! $U_{\text{O}} = \frac{\hat{U}_{\text{I}}}{\omega \cdot R \cdot C} \cdot \cos(\omega \cdot t) - \frac{\hat{U}_{\text{I}}}{\omega \cdot R \cdot C} + U_{\text{O0}}$
\$\;\$ \$\;\$ \$\;\$	$U_{\text{C0}} = U_{\text{O0}} = \frac{\hat{U}_{\text{I}}}{\omega \cdot R \cdot C}$
\$\;\$ \$\;\$ \$\;\$	$U_{\text{O}} = \frac{\hat{U}_{\text{I}}}{\omega \cdot R \cdot C} \cdot \cos(\omega \cdot t)$
\$\;\$ \$\;\$ \$\;\$	$U_{\text{O}} = \frac{\hat{U}_{\text{I}}}{\omega \cdot R \cdot C} \cdot \cos(\omega \cdot t)$

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