$T\dot{y}(t) = -y(t) + Ku(t) \Leftrightarrow y(t) = K(1-e^{-t/T})c$? when...

$u(t)=0$ to $u(t)=c$ at $t=0$ (step response, amplitud c)

and initial condition $y(0)=0$.

Derive $y(t)$ $\dot{y}(t) = \frac{d}{dt}\left(K(1-e^{-t/T})c\right) = Kc\frac{d}{dt}\left(1-e^{-t/T}\right) =$

$= Kc\left(e^{-t/T}\cdot\frac{1}{T}\right) = \frac{Kc}{T}e^{-t/T} \Longrightarrow$ substitute $y(t)$ & $\dot{y}(t)$.

$T\dot{y}(t) = -y(t) + Ku(t) \Leftrightarrow$

$\Leftrightarrow T\cdot\frac{Kc}{T}e^{-t/T} = -K(1-e^{-t/T})c + Ku(t) \Leftrightarrow /u(t)=c/$

$\Leftrightarrow Kce^{-t/T} = -Kc + Ke^{-t/T}c + Kc \Leftrightarrow Kce^{-t/T} = Kce^{-t/T}$ □

Prep 3 $y(t) = K(1-e^{-t/T})c$

1) $\lim_{t\to\infty} = \lim_{t\to\infty} K(1-e^{-t/T})c = K(1-0)c = Kc$, $y(t)$ konvegerar mot Kc i steady-state.

alt 2) differ i steady-state-värdet av $\dot{y}(t)$

Differ: $T\dot{y}(t) = -y(t) + Ku(t) \Rightarrow$ i steddy-state $\xrightarrow{\text{stabilt}}$ är $\dot{y}(t)=0$

$\Rightarrow 0 = -y_{ss} + Ku(t)$ där y_{ss} är steddy-state-värdet för $y(t)$.

$u(t)=c \Rightarrow y_{ss} = Kc$. $y(t)$ konvegerar till Kc i steady-state.