Answer on Question #44771, Physics, Electric Circuits

Task:

$$V_{steady} = \frac{1}{(C^2 R^2 \omega^2 + 1)} \sin \omega t + \frac{CR\omega}{C^2 R^2 \omega^2 + 1} \cos \omega t$$

$$V_{transient} = \frac{CR\omega}{C^2 R^2 \omega^2 + 1} e^{\frac{-1}{CR}t}$$

Explain why they are called steady state and transient state voltages, respectively

Solution:

A short-lived oscillation in a system caused by a sudden change of voltage or current expressed as a function of time exponentially, so transient state voltages is

$$V_{transitent} = \frac{CR\omega}{C^2 R^2 \omega^2 + 1} e^{\frac{-1}{CR}t} \ .$$

Voltage that does not change over time is called steady state voltage, so steady state voltage is defined as $V_{steady} = \frac{1}{(C^2 R^2 \omega^2 + 1)} \sin \omega t + \frac{CR\omega}{C^2 R^2 \omega^2 + 1} \cos \omega t$.