RIS LAB 2
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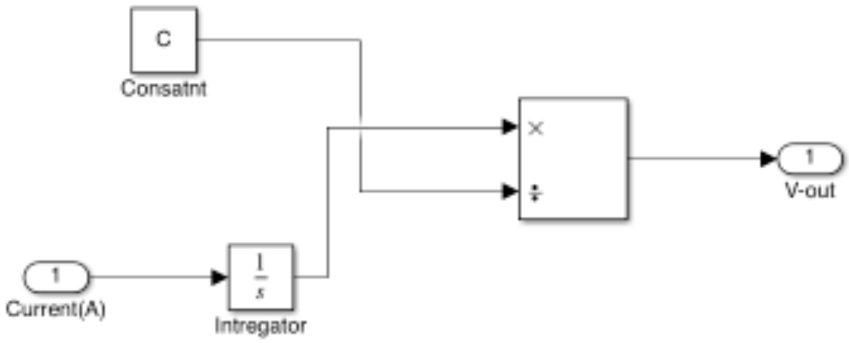
LAB1 (Task1-3)

Task 1.1.

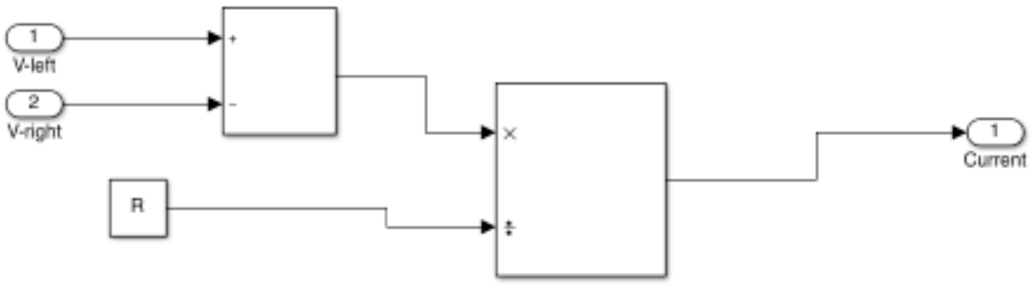
Explain why Fig. 1.4 represents the model of a capacitor by writing down the equation it implements.

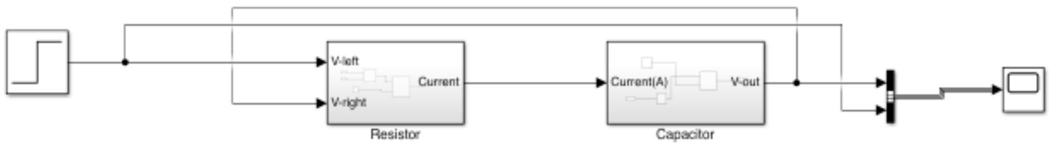


$$\frac{1}{C} \times \int I = V$$

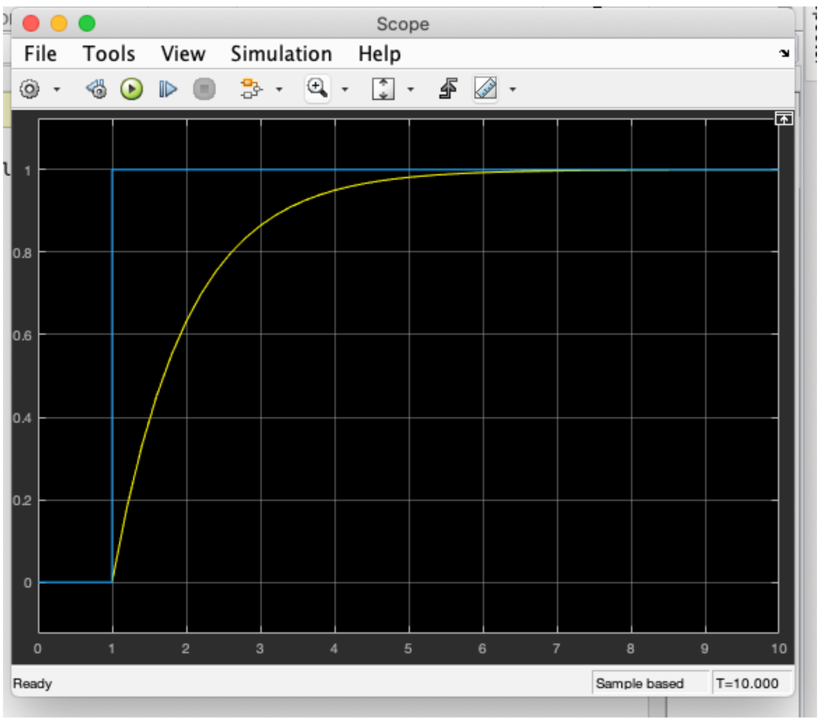
$$I = C \times \frac{dV}{dt}$$

Task 1.2. Proceed as follows:





What is the time-constant of this system? How can you see it in the plot? Change the simulation-time (in input field in the tool-ribbon) from the default 10.0 seconds to 5 times this time-constant.

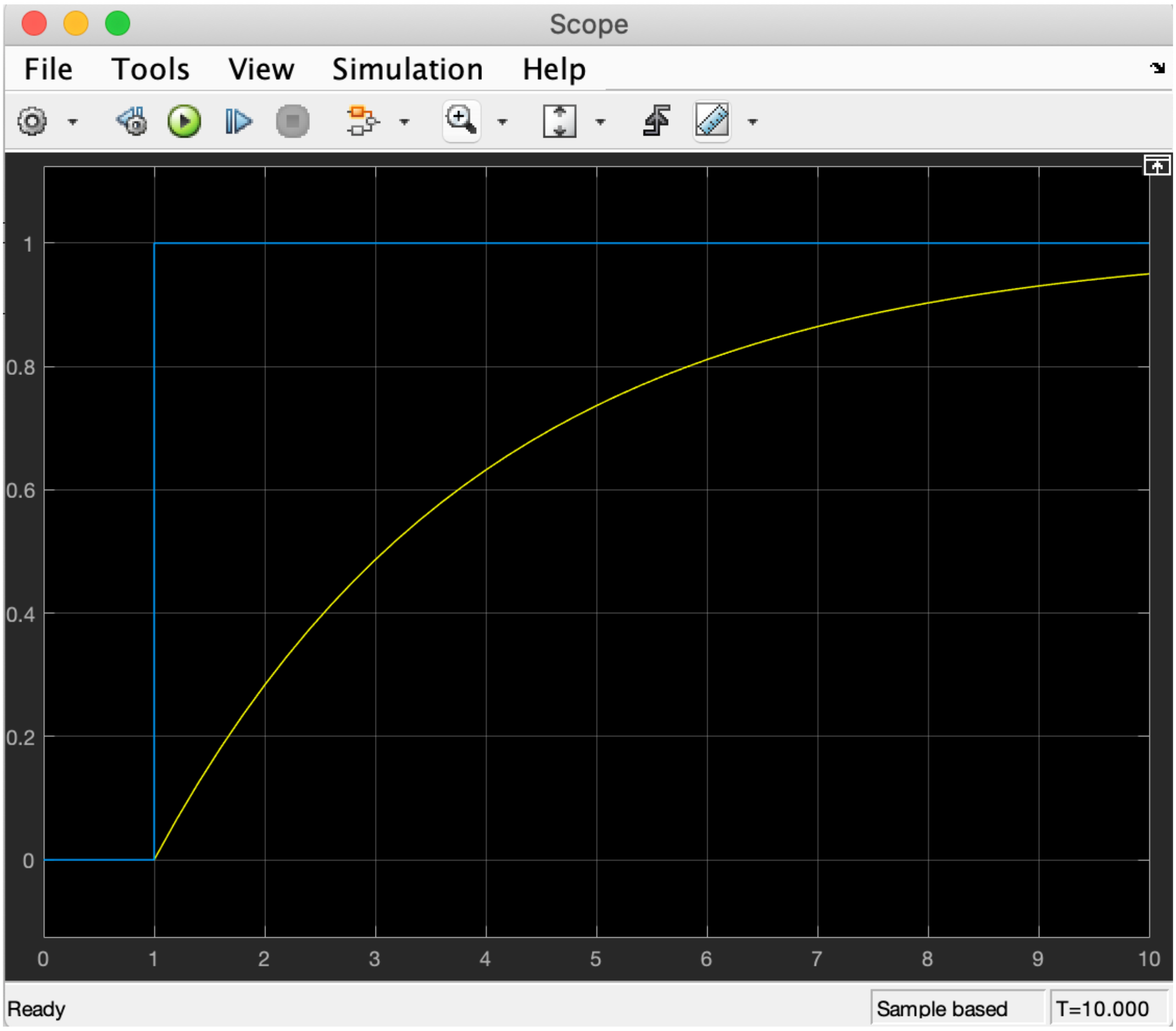


This can be seen in the plot as after 1 second the value reaches around 0.63 which is roughly the same as (1/e *100).

Run the system by pressing Ctrl+T or by clicking the run-button. Look at the output by double-clicking the scope.

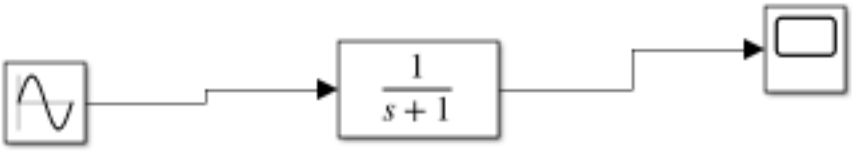
Now change the variables R and C in the workspace and re-run the simulation. Does the scope display change as expected?

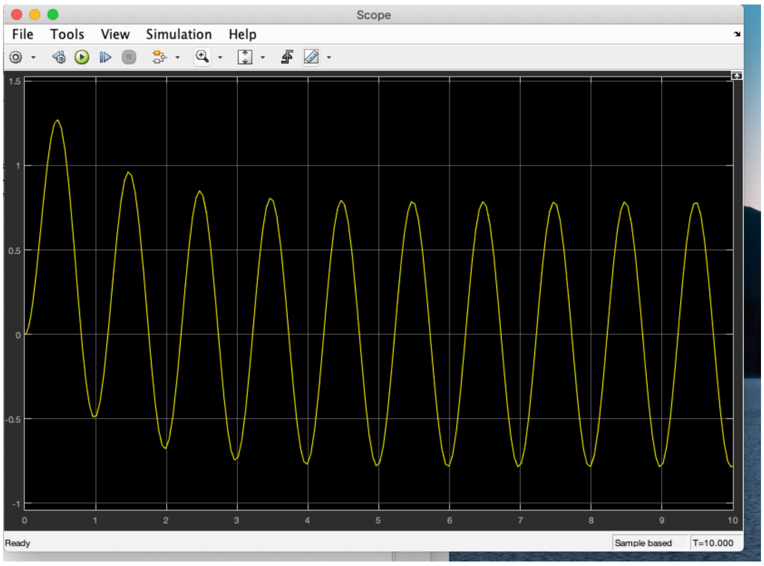
I changed the value of R into 3e06 and after that expected the time constant to also be 3 times more and this was proved by my plot.



Task 1.3.

How many seconds does it take for the initial transient to die off in the output response?





It takes around 3.5 seconds as after this the plot is stable.

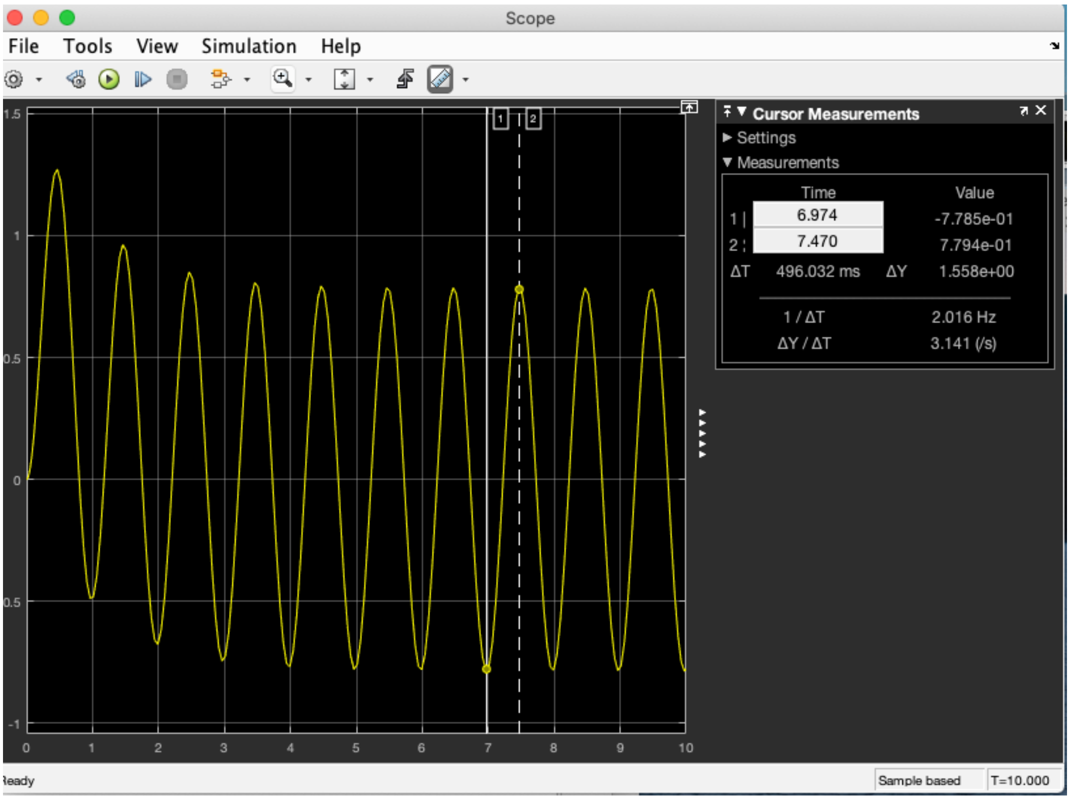
What is the expected gain-ratio (ratio of output to input amplitudes) from theory? You can find this by replacing s by jω in the transfer-function and evaluating |H(jω)|.

The expected ratio is

$$H(\omega) = \frac{1}{2\pi i + 1}$$

$$|H(\omega)| = 0.1572$$

Zoom in the scope to find the amplitude ratio of the output wave to the input wave. Is it as expected?



The difference between crest and trough is 1.558 therefore the amplitude is 0.779.

Our input was 5v therefore now if we divide 0.779/5 this 0.1558.

Which was roughly the same as we got in the previous answer.