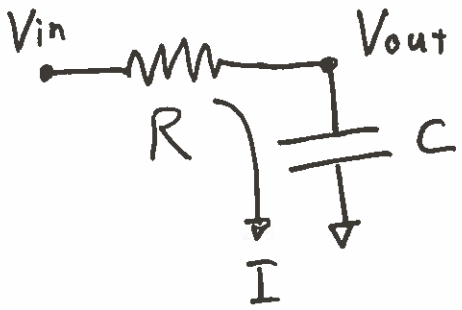
Last Week



$$\frac{V_{in}-V_{out}}{R} = I = C\frac{dV_{out}}{dt}$$

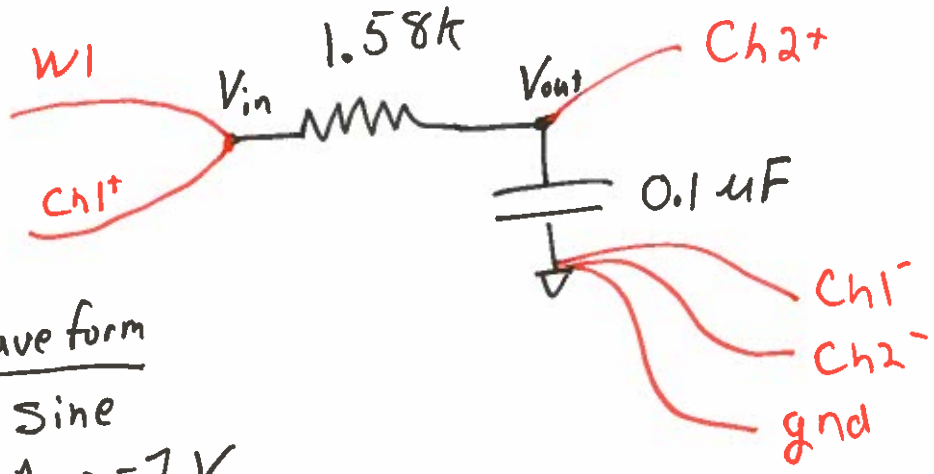
ohm Cap.

$$RC\frac{dV_{out}}{dt} = (V_{in}-V_{out})$$

Sq. Wave $\Rightarrow$ Solution is of the form

$$e^{-t/RC}$$

Your Task



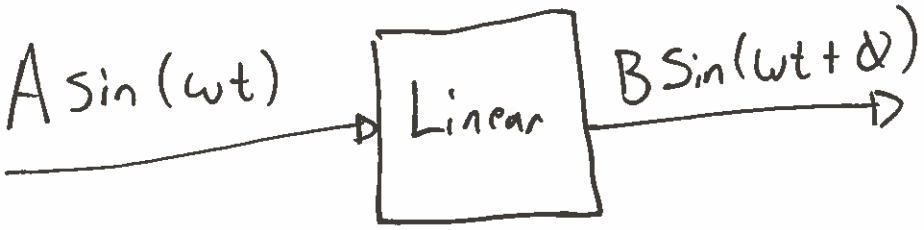
Wave form

Sine
Amp = 1V
offset = 0V
Vary freq.

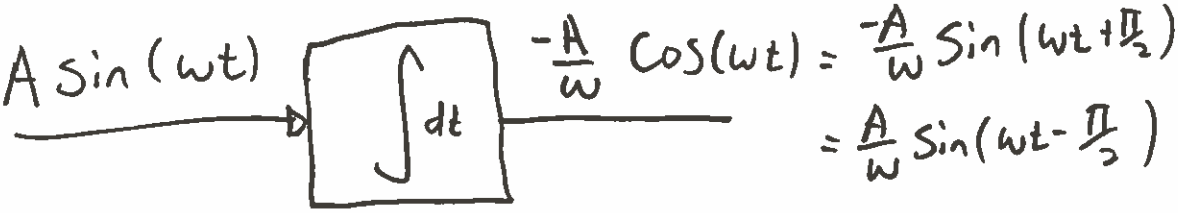
Questions

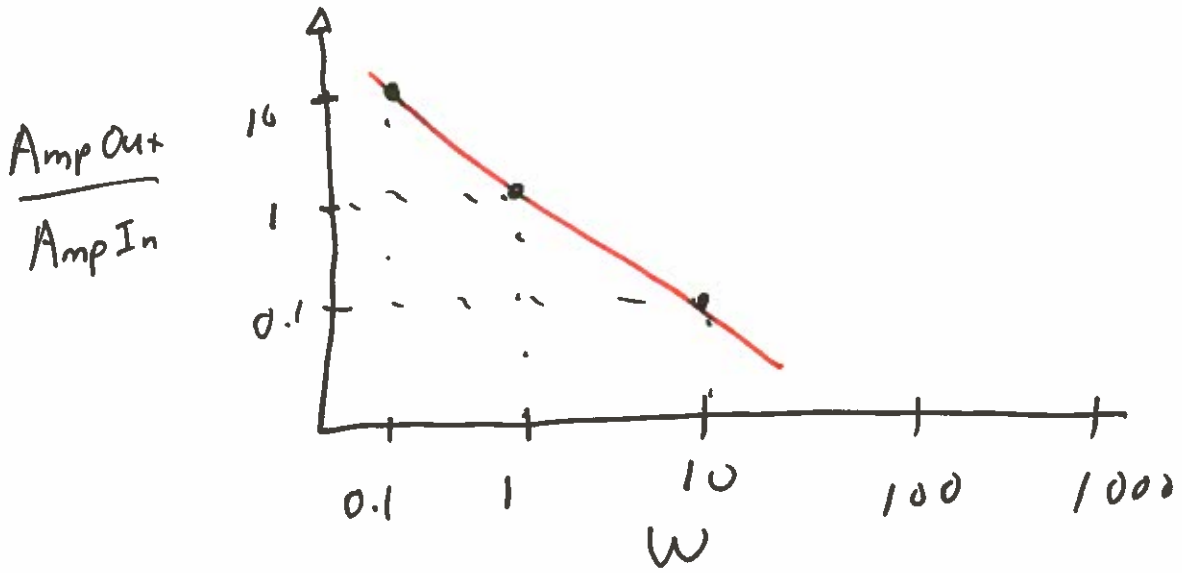
- How does the freq. of V_{out} change as you adjust the freq. of V_{in}?
- How does amplitude of V_{out} change as you adjust the freq of V_{in}?
- How does the phase of V_{out} relative to V_{in} change as you adjust freq. of V_{in}?
- Why did I use 1.58k?
- Any other observations?

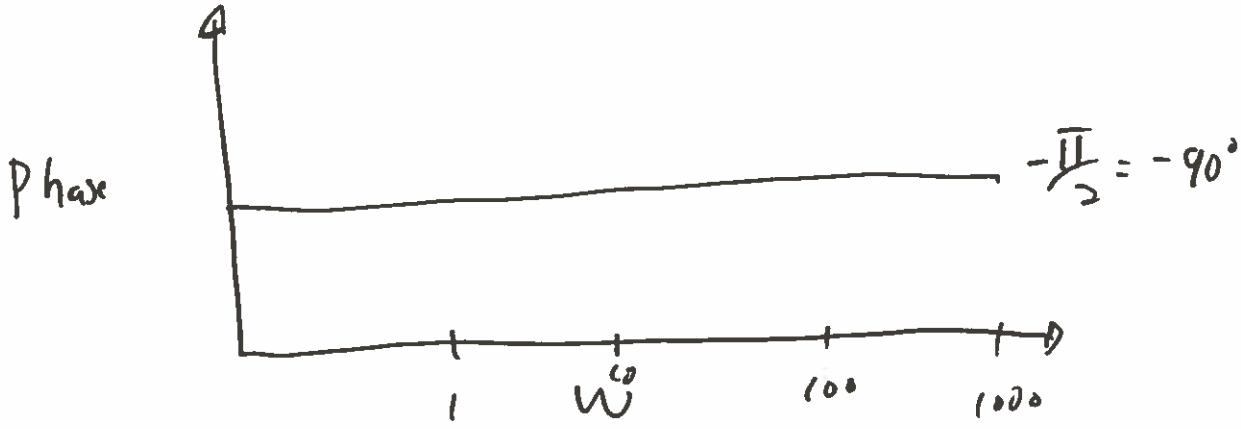
Linear Systems



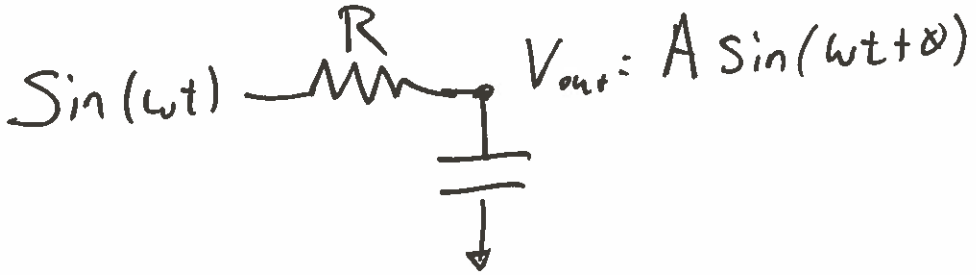
Example







Analysis



$$RC\frac{dV_o}{dt} = -(V_{in} - V_{out})$$

⇓ See notes but notice that D.E. turns to a trig. eqn.

Final Result

$$\alpha = \operatorname{atan}(-RC\omega)$$

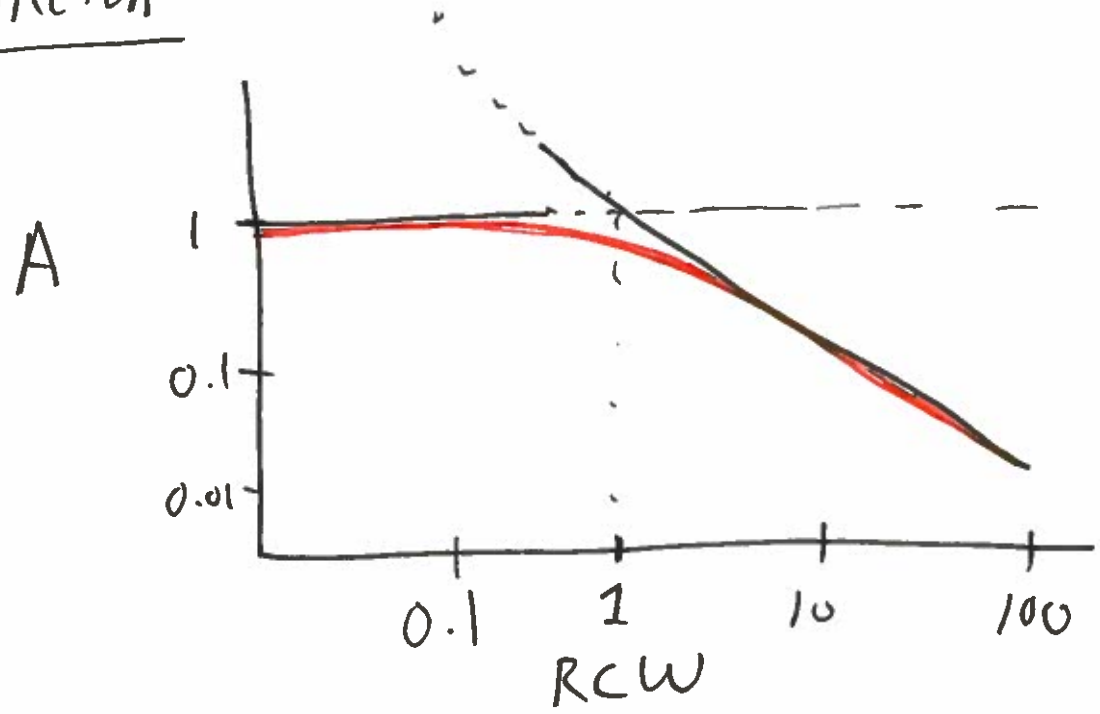
$$A = \frac{1}{\sqrt{1 + (RC\omega)^2}}$$

↑ ω is in rad/sec

Experimentally

Check these formula at a few data points

Sketch



- Show Bode plot tool in waveforms.
- Demo changes in R and C.