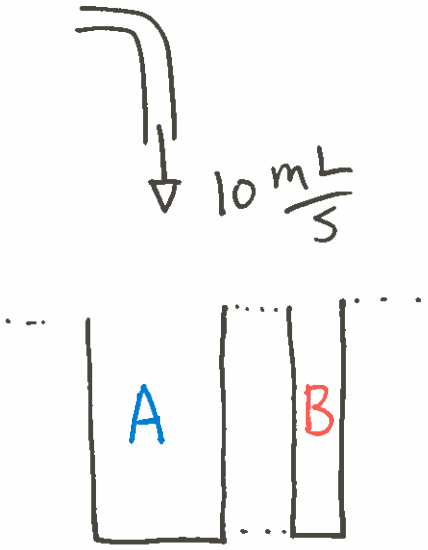
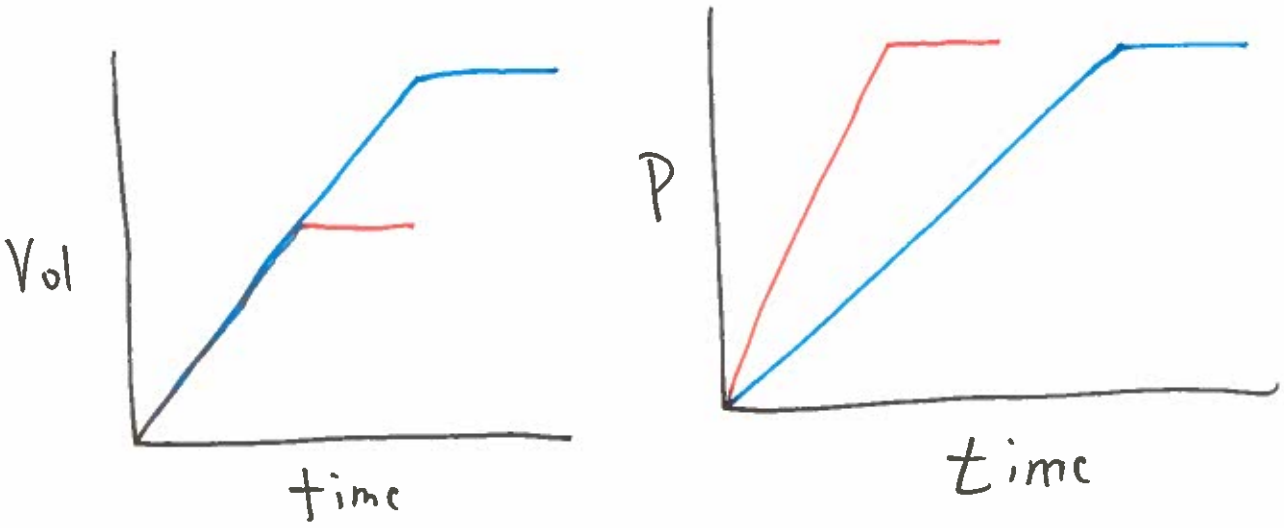
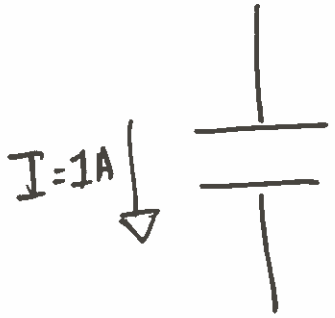


- Plot Volume as a fcn of time.
- Plot pressure as a fcn of time.



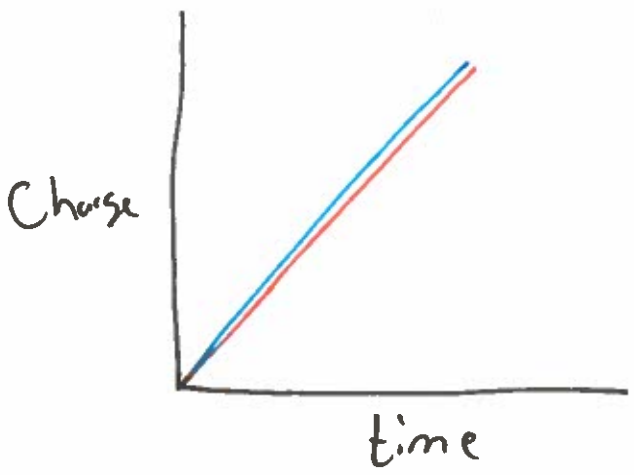
$$\underbrace{\text{Volume}}_{\text{Storage}} = \text{Capacitance} \times \underbrace{\text{Pressure}}_{\text{Effort.}}$$

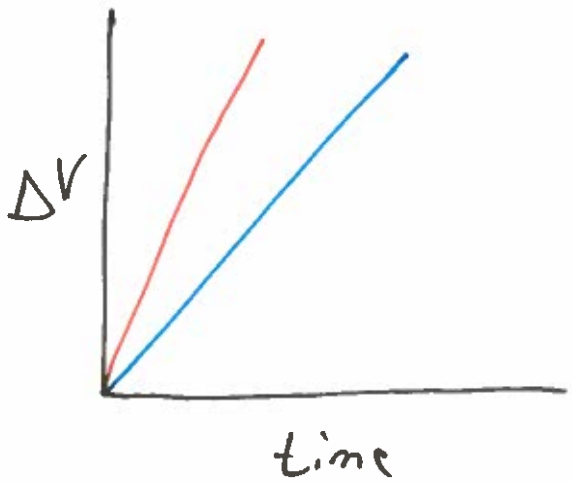


$C_1 = 10\,\mu F$

$C_2 = 1\,\mu F$

- Plot Charge as a fcn of time
- Plot Voltage as a fcn of time.





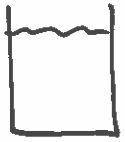
$$\underbrace{\text{Charge}}_{\text{Storage}} = \text{Capacitance} \times \underbrace{\Delta\,\text{Voltage}}_{\text{Effort}}$$

Hydraulic

R: Pipe

$\Delta P_{ress} = R \cdot flow$

C:



$\int flow\ dt = Volume$

$Volume = C\ Pressure$

$\frac{dVol}{dt} = flow = C\frac{dP}{dt}$

Electric

$\Delta V = I R$

$\int Current\ dt = Charge$

$Charge = C \times \Delta Voltage$

$I = C\frac{d\Delta V}{dt}$

General

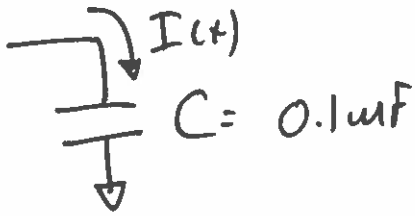
$Effort = R \cdot Flow$

$\int flow\ dt = Storage\ or\ State$

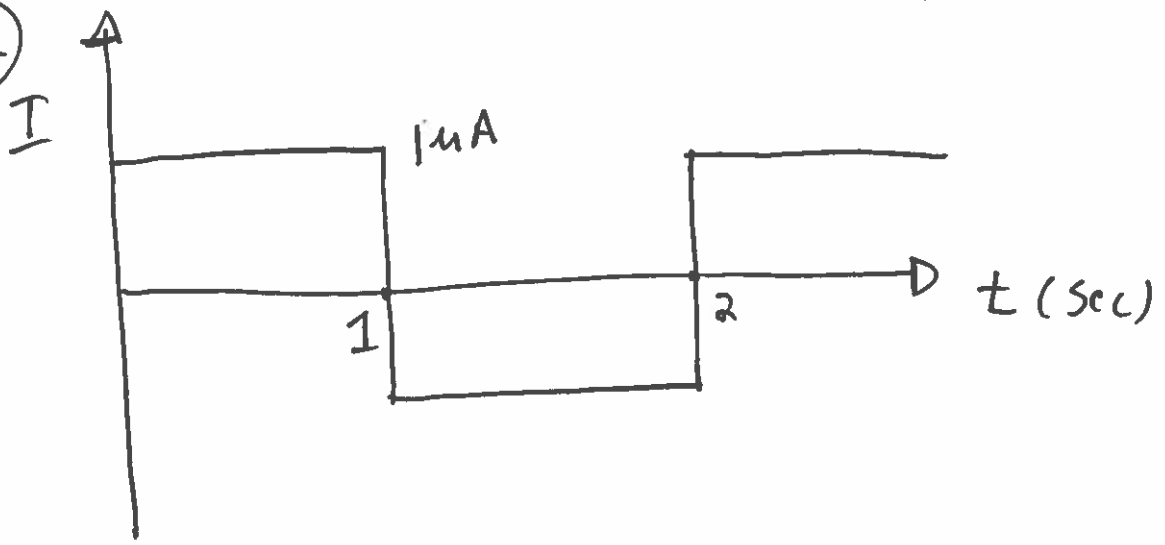
$Storage = C \times Effort$

$flow = C\frac{dEffort}{dt}$

Conduct the following Demo



#1

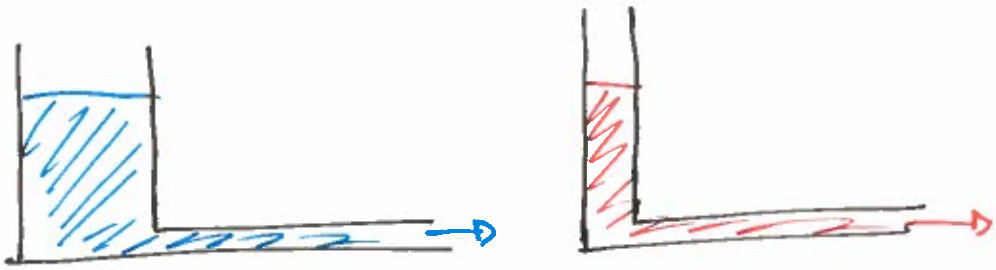


Sketch V(t) w/ units

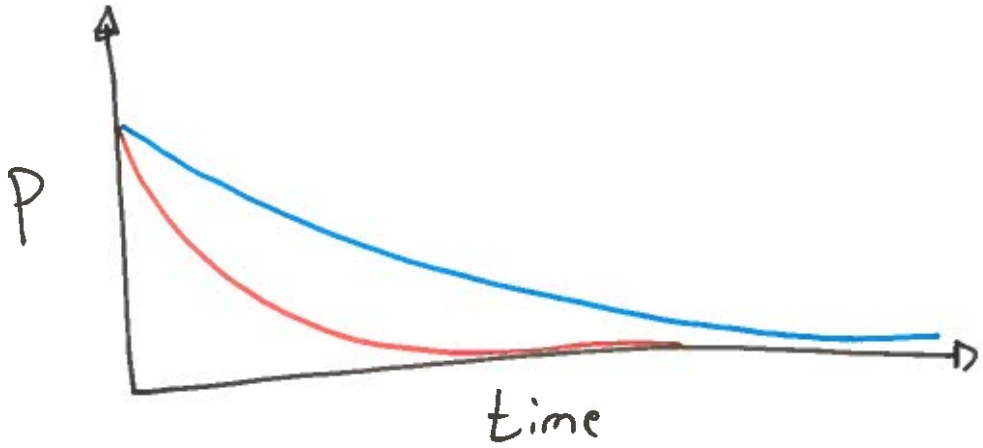
Repeat for

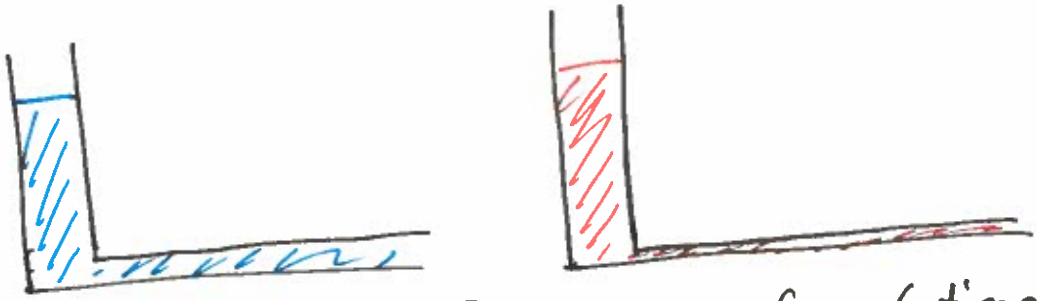
#2	C= 0.1uF	I = 2 uA
#3	C= 0.1uf	I = ½ uA
#4	C=1 uF	I = 1uA

Tank Demo

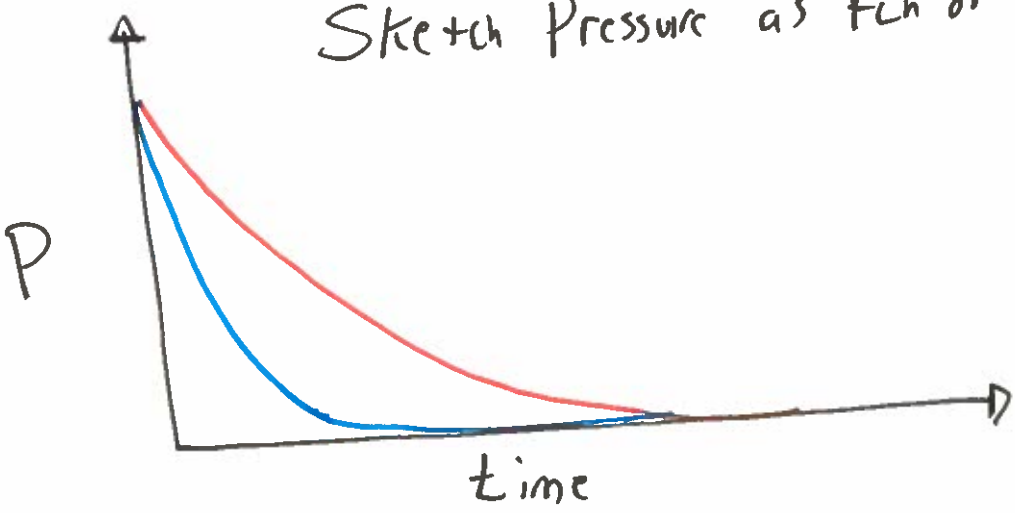


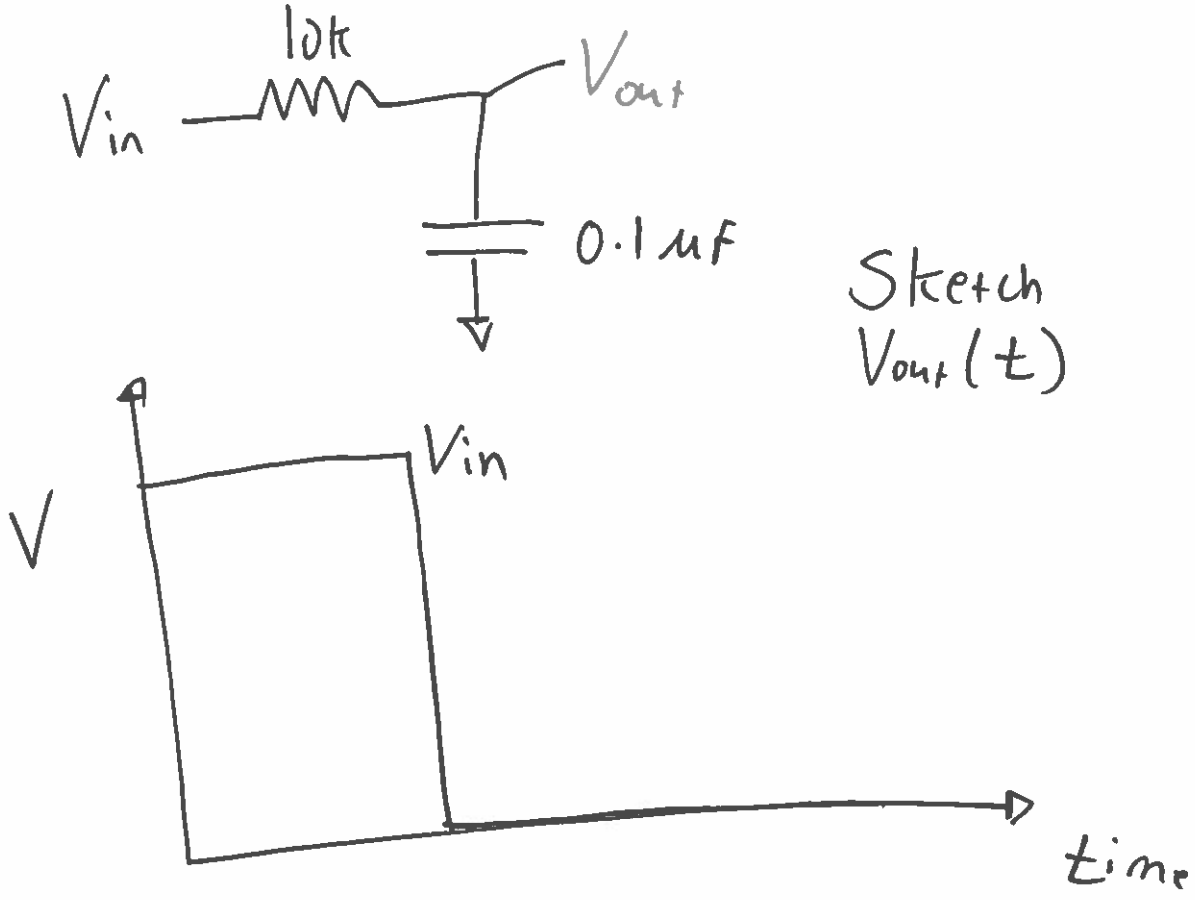
- Sketch Pressure as fcn of time



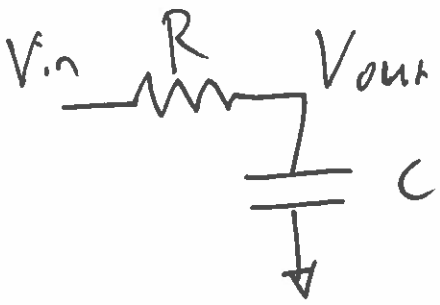


Sketch Pressure as fcn of time.





Now on same plot, sketch V(t)
when I replace R with 100 k



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

$V_{in}(t=0) = 1$, $V_{out}(t=0) = 1 \Longrightarrow I = 0$

$V_{in}(t>0) = 0$

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

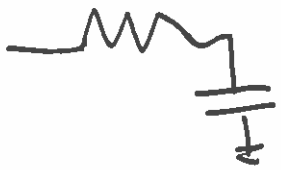
$$-\frac{dt}{RC} = \frac{dV_{out}}{V_{out}}$$

$$-\frac{t}{RC} + B = \ln(V_{out})$$

$B \leftarrow$ const.

$$V_{out} = e^{(-t/RC + B)} = e^{B} e^{-t/RC} = B e^{-t/RC}$$

$$V_{out}(t=0) = 1 = Be^{0} \Longrightarrow V_{out}(t) = e^{-t/RC}$$

Hydraulic	Electric	General
R: $\Delta P = R \cdot flow$	$\Delta V = I R$	$Effort = R \cdot flow$
C: $flow = C \frac{dP}{dt}$	$I = C \frac{dV}{dt}$	$flow = C \frac{dEffort}{dt}$
		
$-P = RC \frac{dP}{dt}$	$-V = RC \frac{dV}{dt}$	$-Effort = RC \frac{dEffort}{dt}$