

# Clampers (H.1)

20170424

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## Wheel clamp



function clamp(x, min, max):

```
if (x < min) then
  x = min;
else if (x > max) then
  x = max;
```

```
return x;
```

end clamp

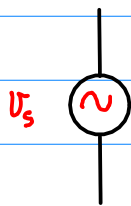
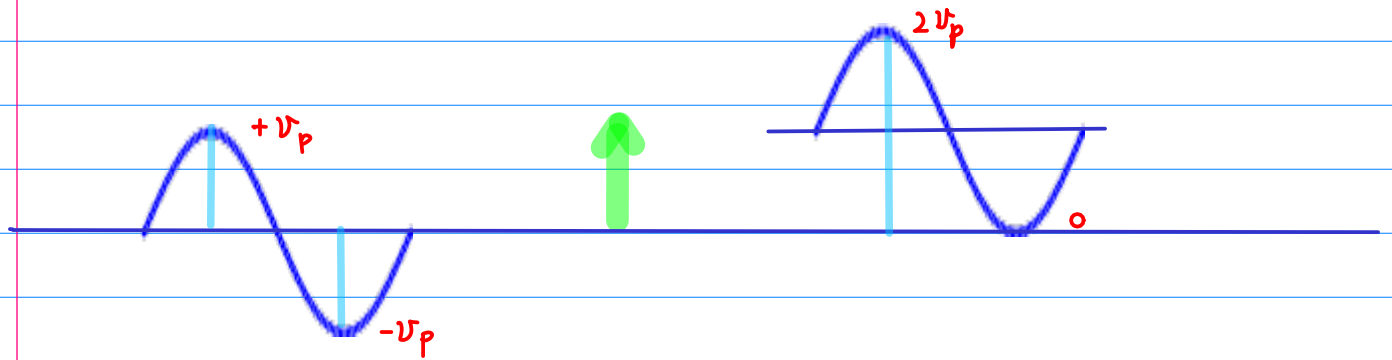
## woodworking clamps



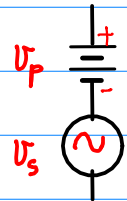
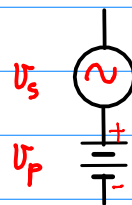
## Surgical Clamp



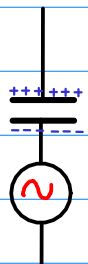
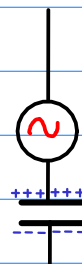
# Clampers



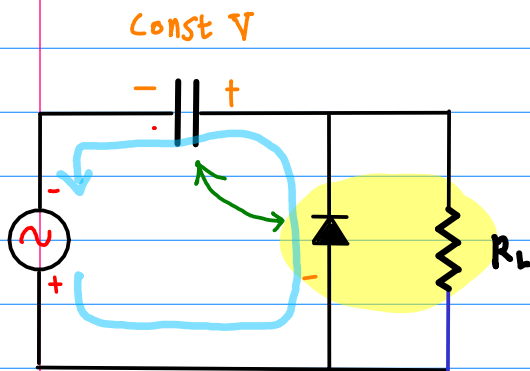
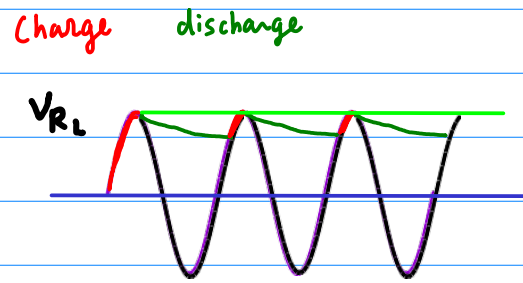
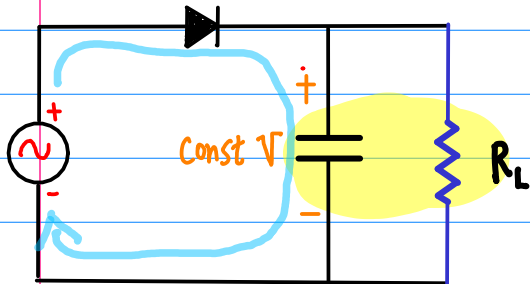
AC only



AC+DC bias

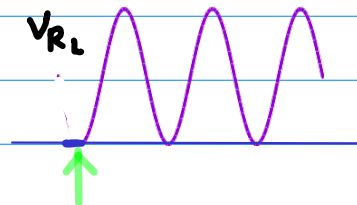
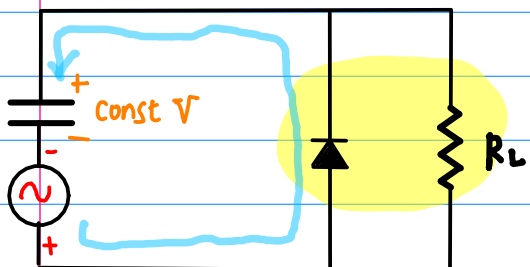


# Capacitor-input filter



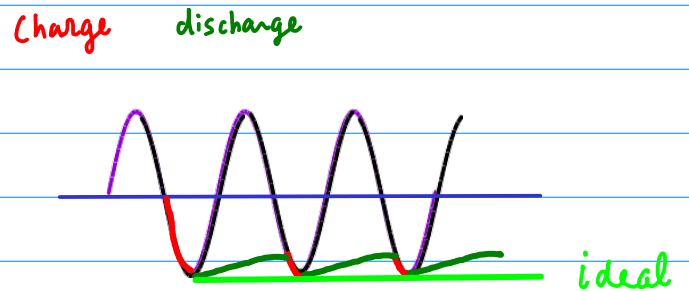
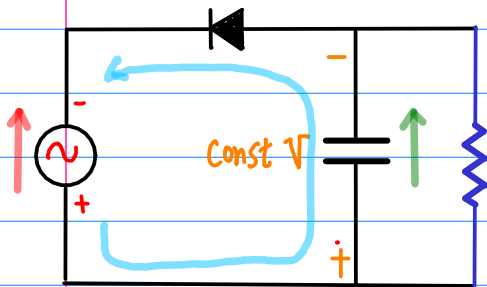
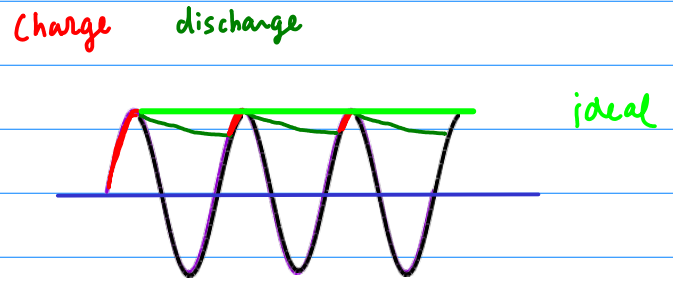
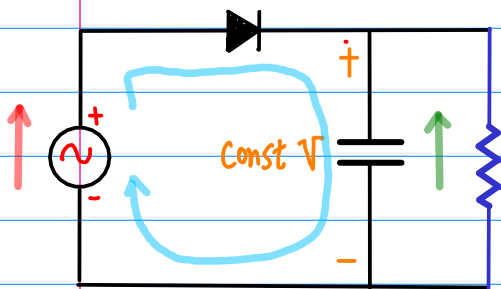
Clamper

# Clamper

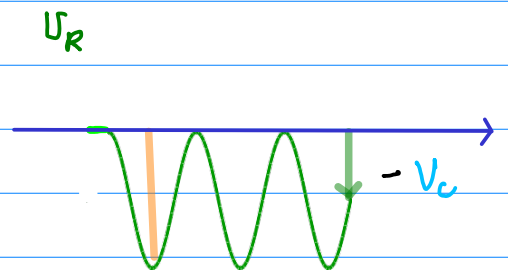
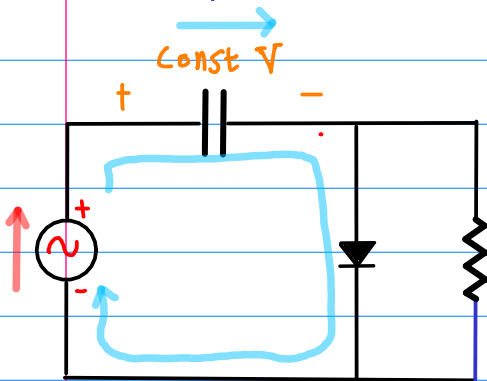


# Cap Input - Filters V.S. Clampers

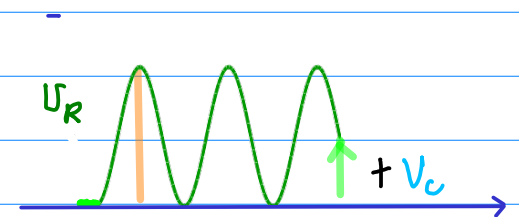
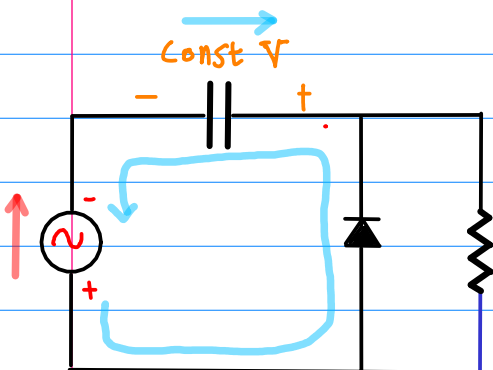
## \* Capacitor-input filter



## \* Clampers

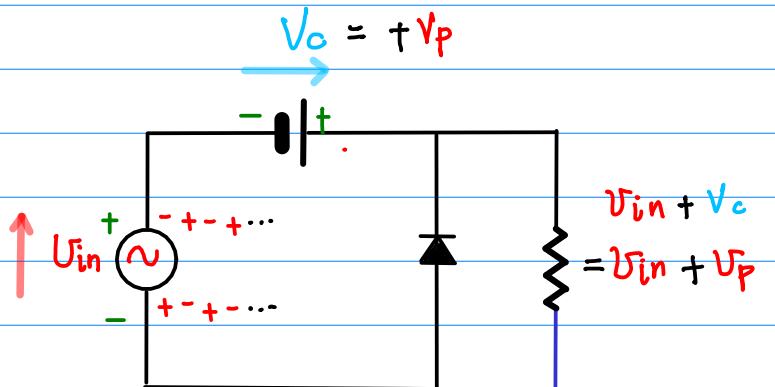
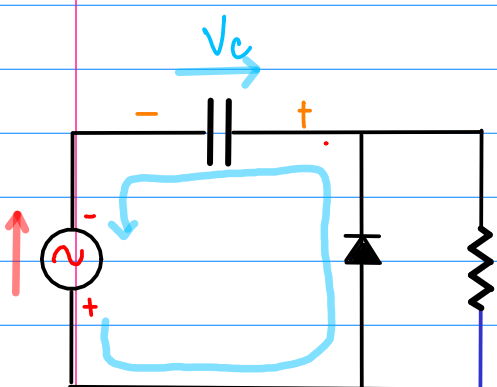
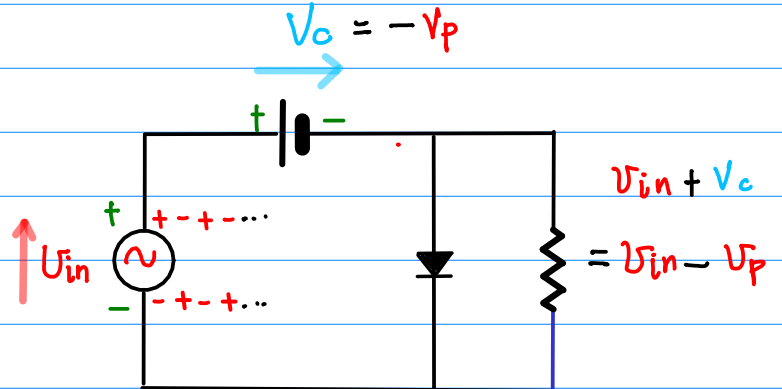
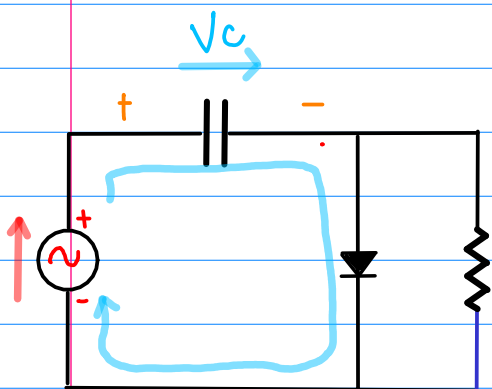
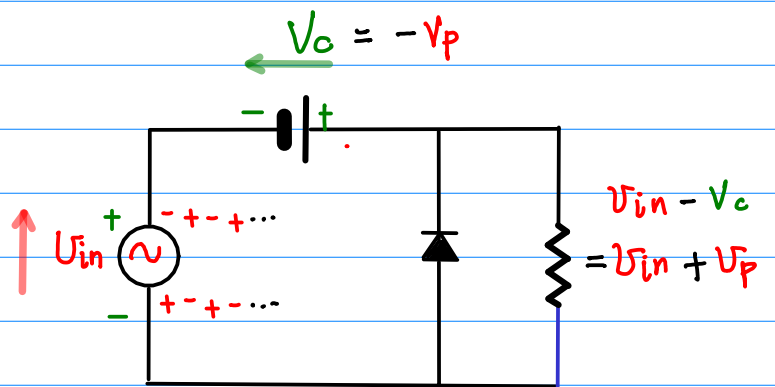
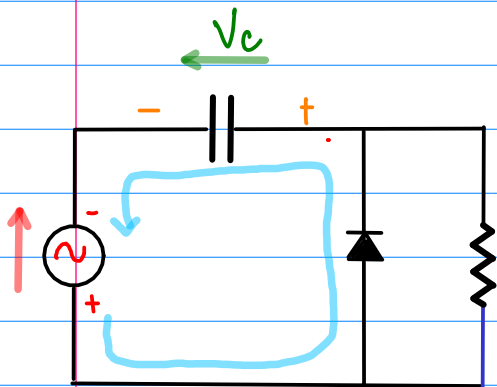
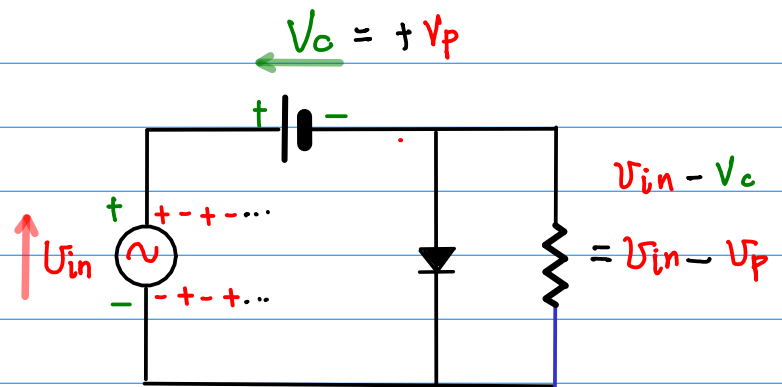
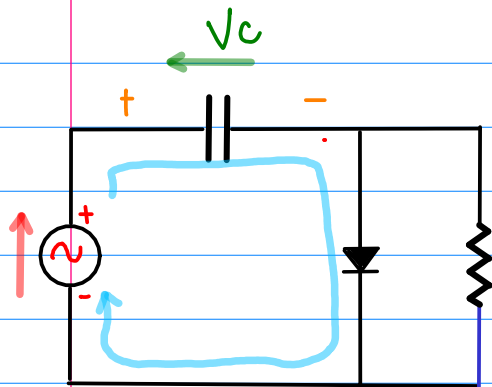


$$U_R = U_{in} - V_c$$

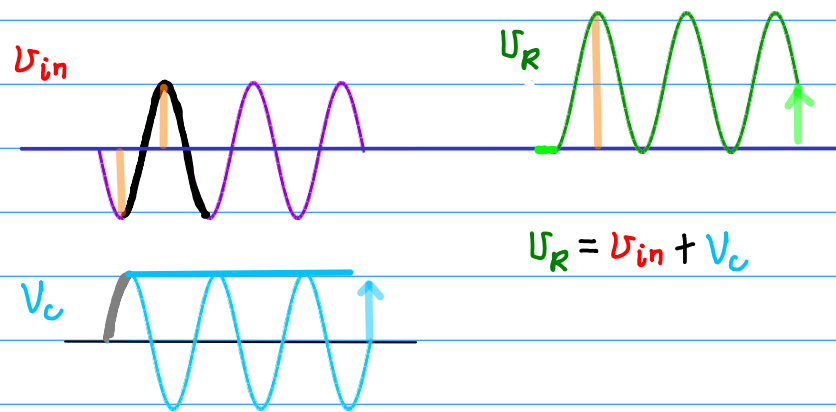
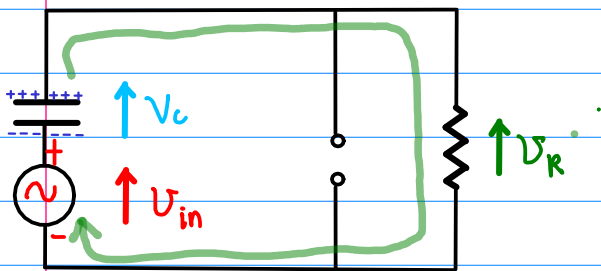
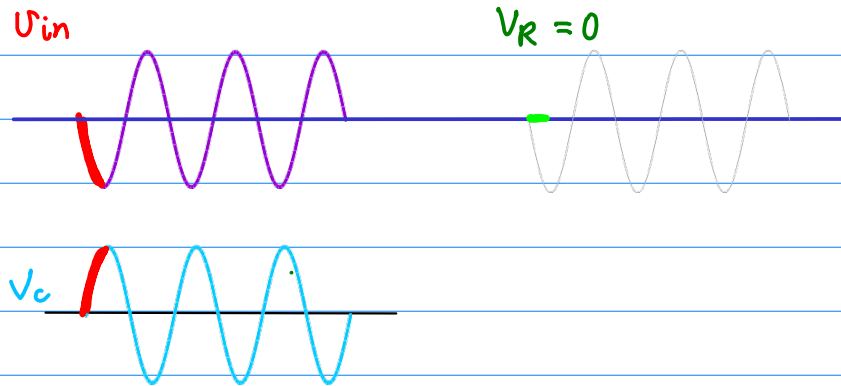
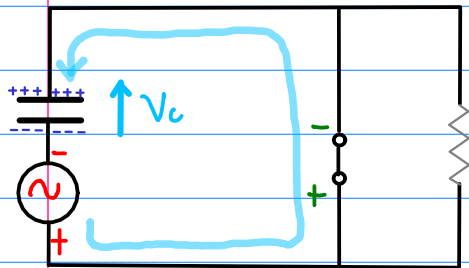
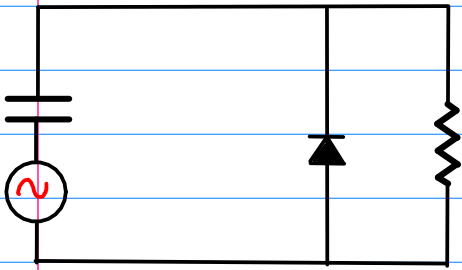


$$U_R = U_{in} + V_c$$

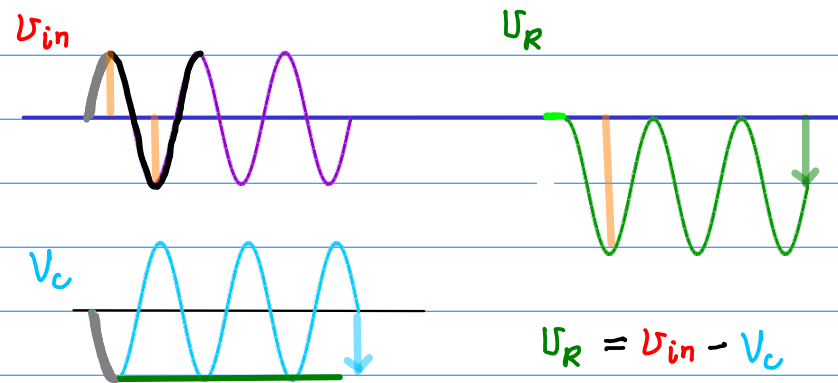
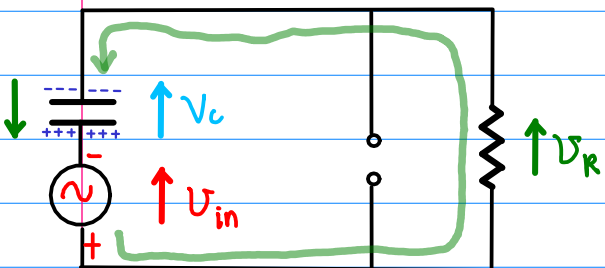
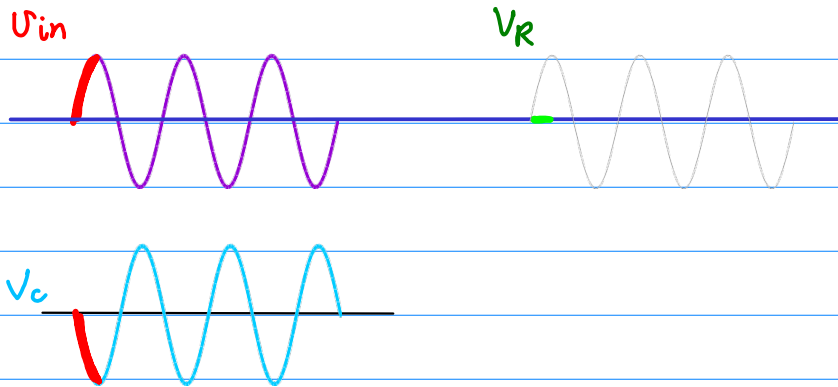
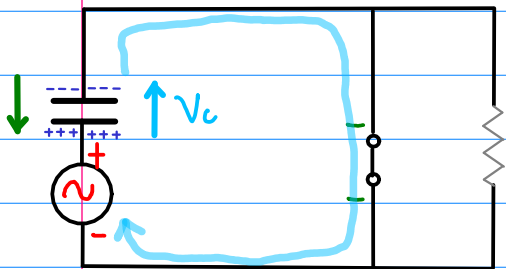
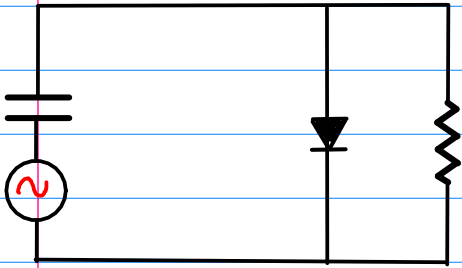
\* clippers -  $V_c$  measured in different direction



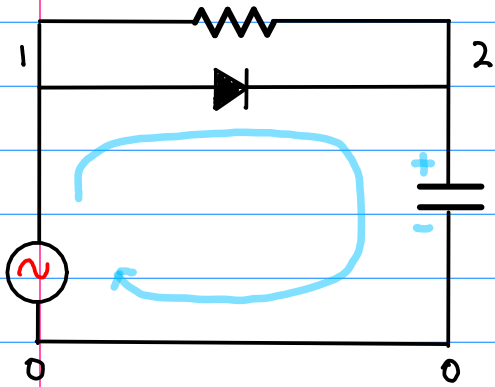
# Positive Clamper



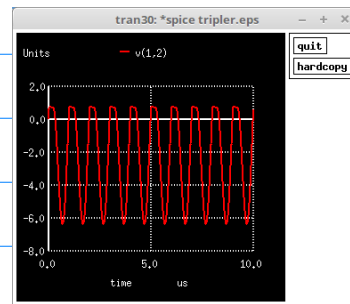
# Negative Clamper





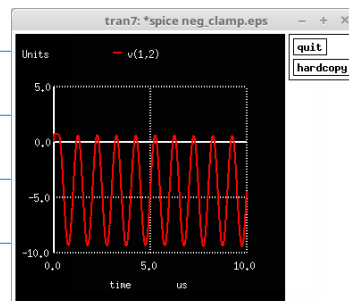


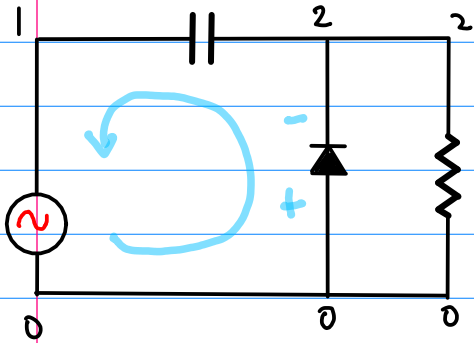
```
*SPICE neg_clamp.eps
C1 2 0 1000p
R1 1 2 500
D1 1 2 diode
V1 1 0 SIN(0 5 1000k)
.model diode d
.tran 0.001u 10u
.end
```



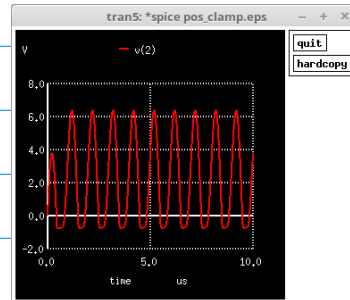
```
*SPICE neg_clamp.eps
C1 2 0 1000p

D1 1 2 diode
V1 1 0 SIN(0 5 1000k)
.model diode d
.tran 0.001u 10u
.end
```



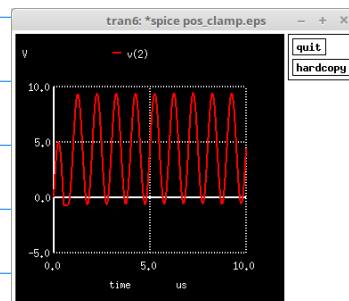


```
*SPICE pos_clamp.eps
C1 1 2 1000p
R1 0 2 500
D1 0 2 diode
V1 1 0 SIN(0 5 1000k)
.model diode d
.tran 0.001u 10u
.end
```

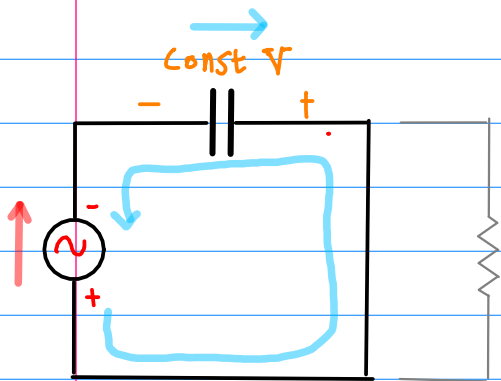
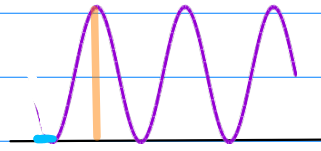
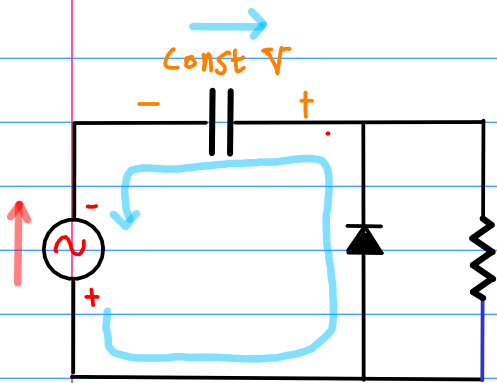


```
*SPICE pos_clamp.eps
C1 1 2 1000p

D1 0 2 diode
V1 1 0 SIN(0 5 1000k)
.model diode d
.tran 0.001u 10u
.end
```

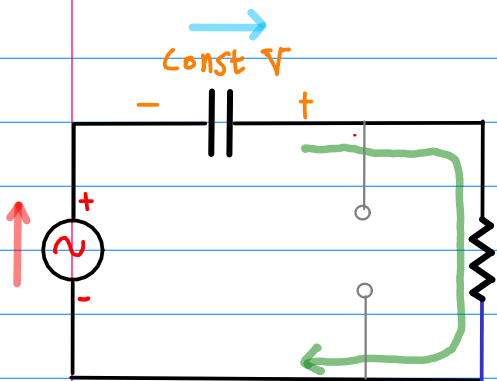


# Positive Clamper



ON

initial charge stage



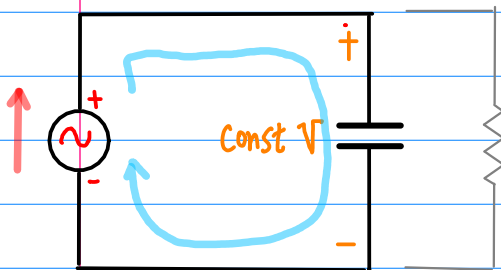
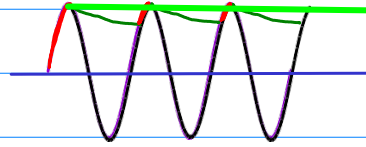
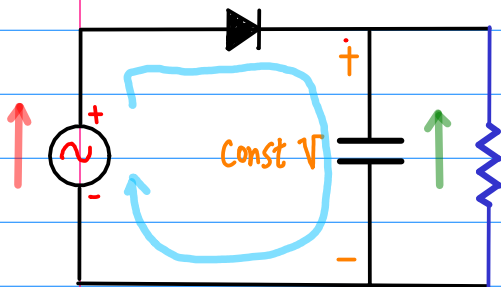
OFF

most of the period

the positive peak value is maintained  
 $V_p$  in this case

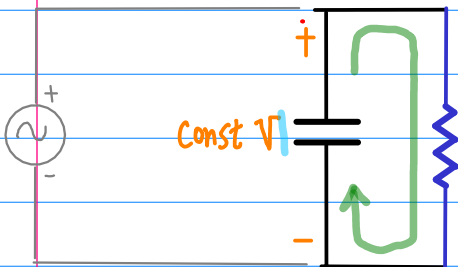
$$RC \gg 100T$$

# Cap Input Filter



ON

initial charge stage

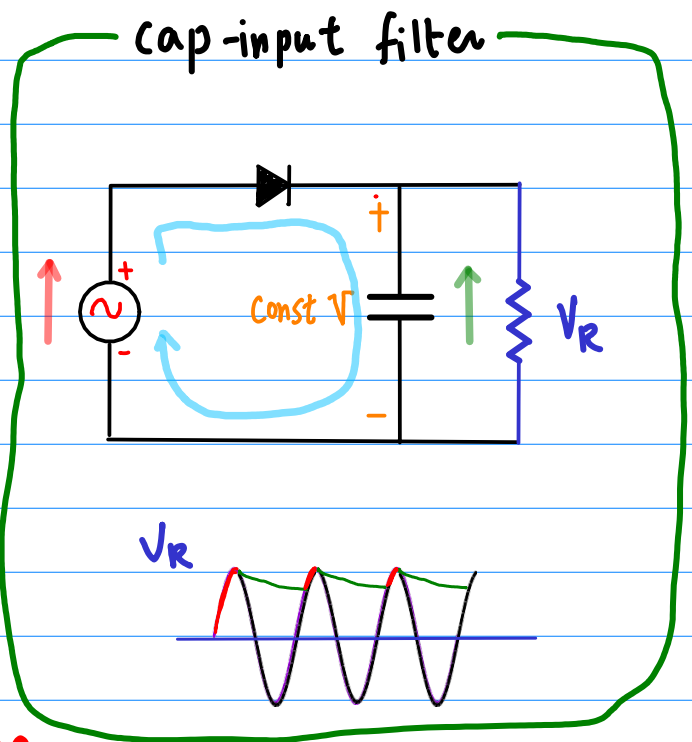
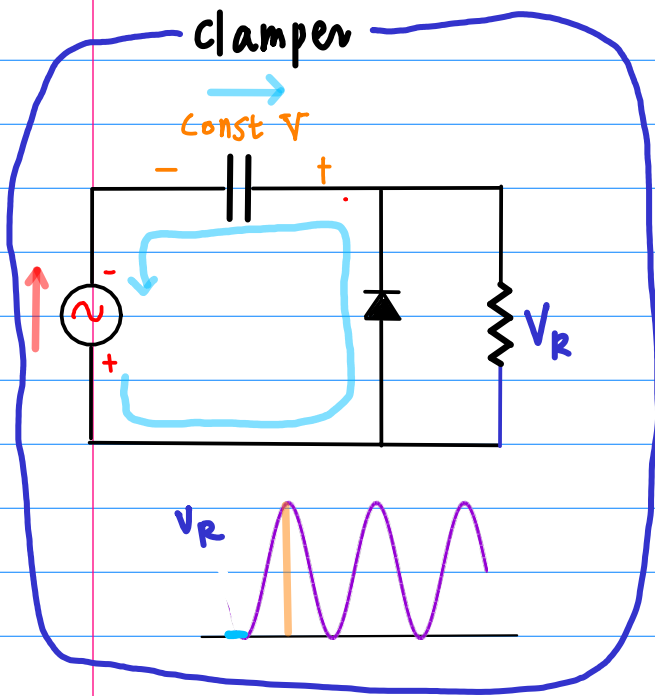


OFF

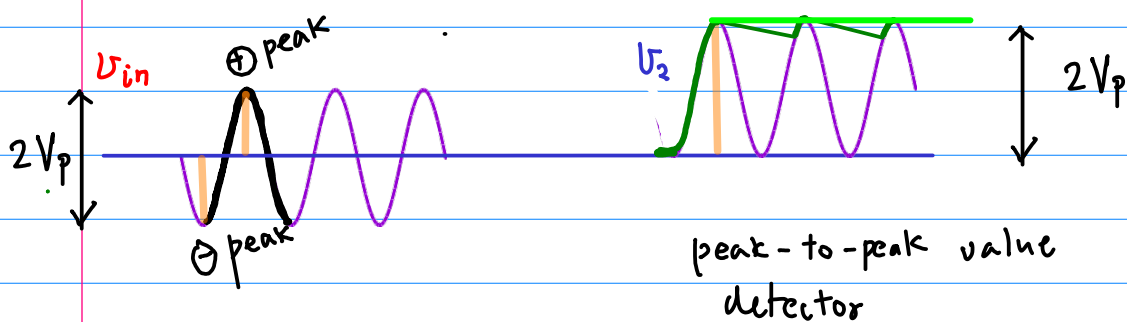
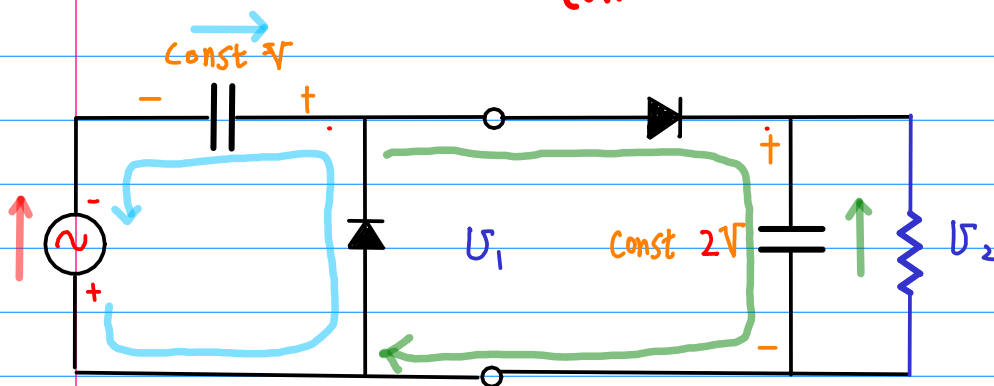
discharge stage creates ripples

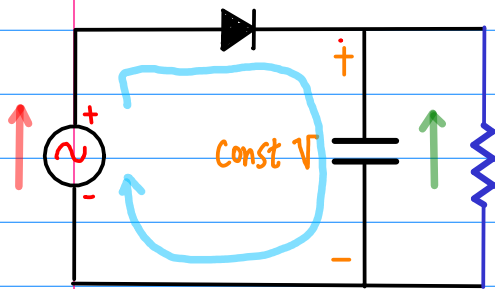
it can be viewed as  
the positive peak value is maintained  
 $V_p$  in this case

# Peak-to-Peak Detector

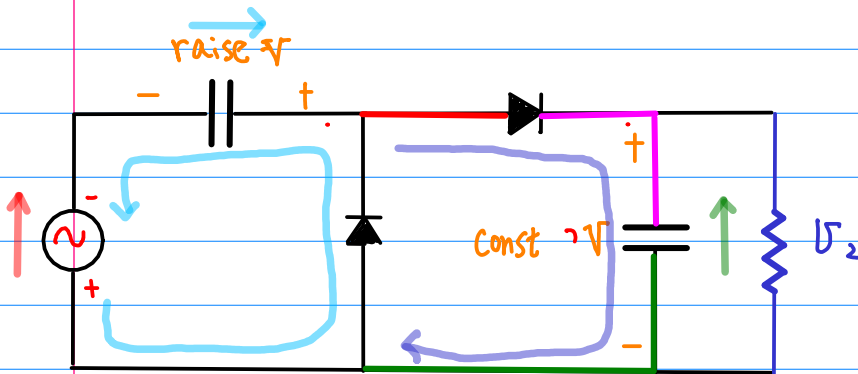
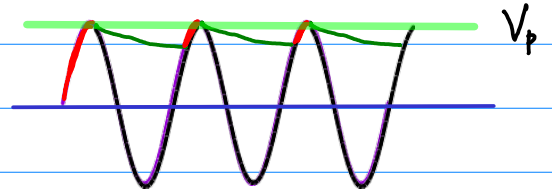


combine

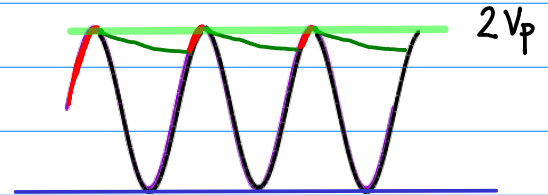




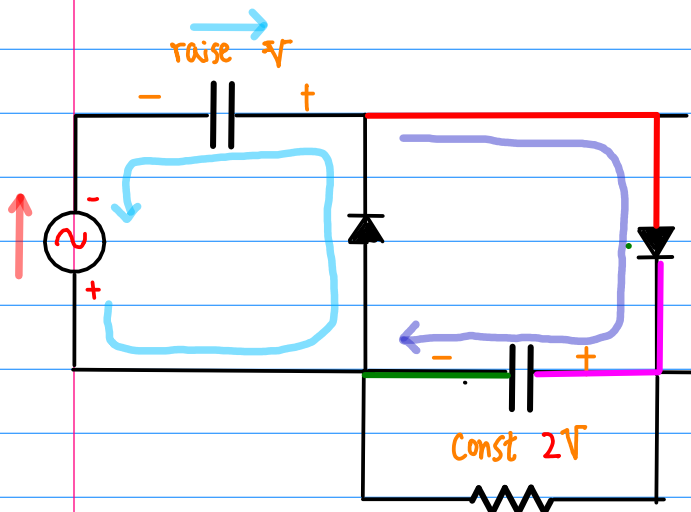
Clamper



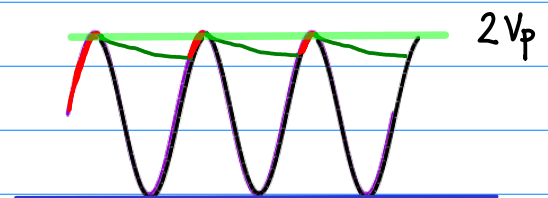
peak-to-peak detector



|||

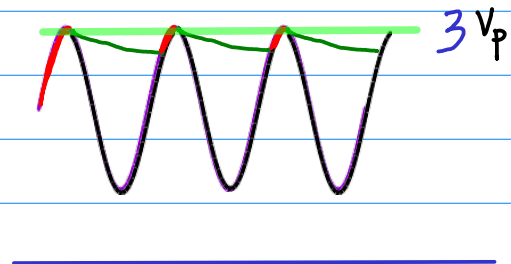
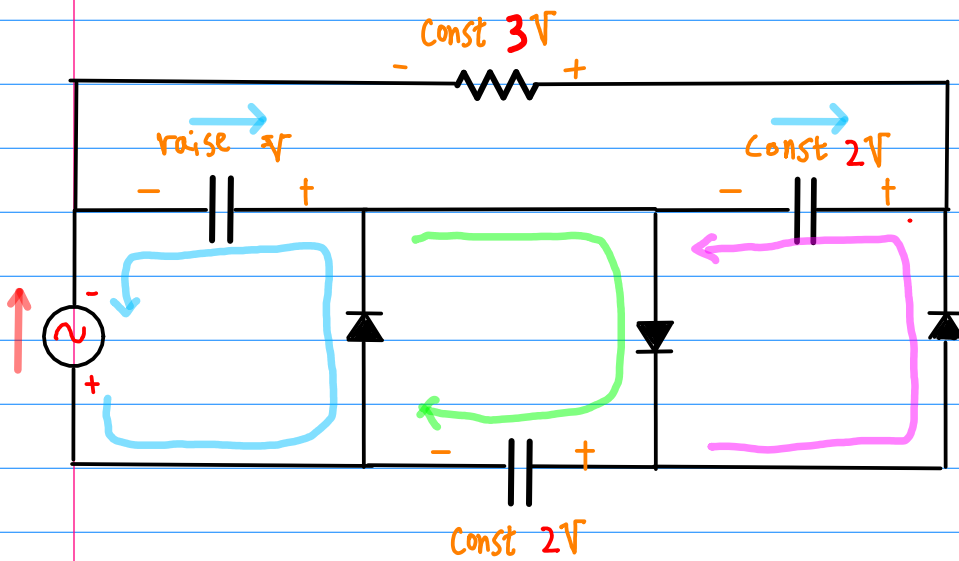
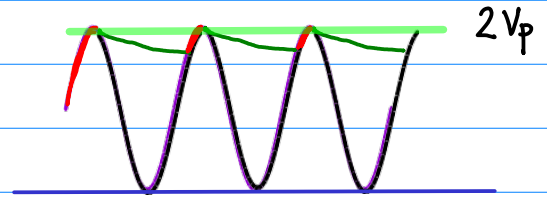
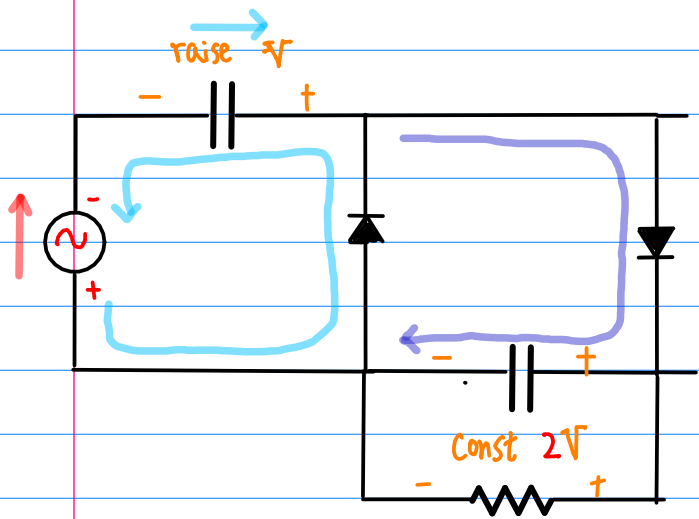


peak-to-peak detector

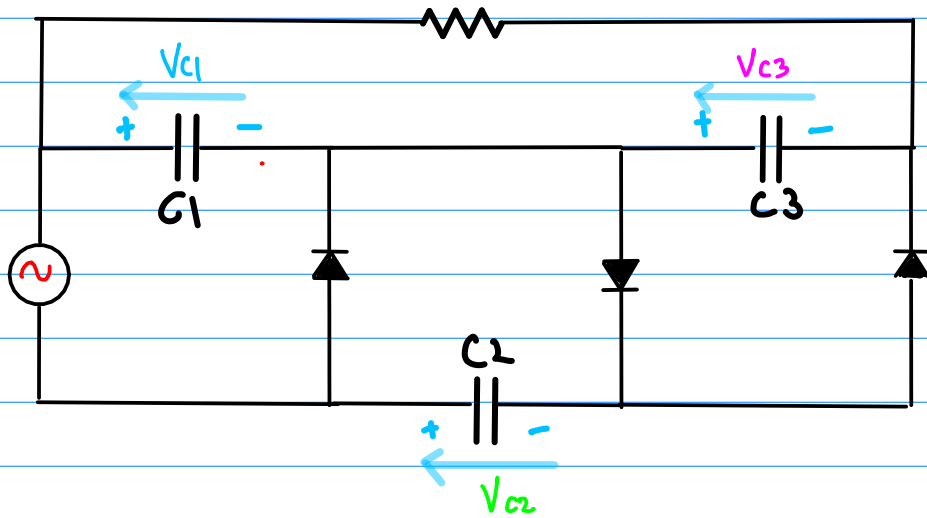


different drawings

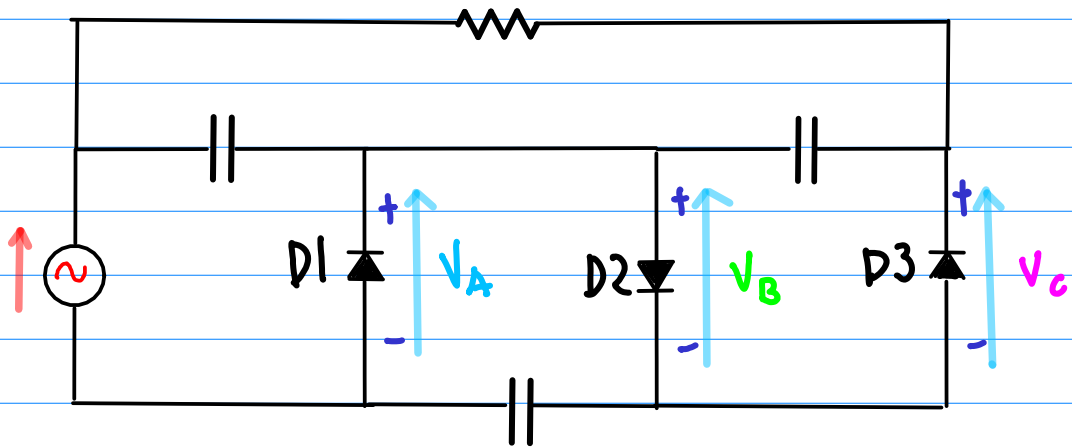
# Voltage Tripler



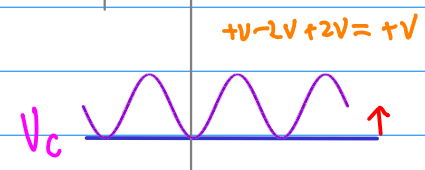
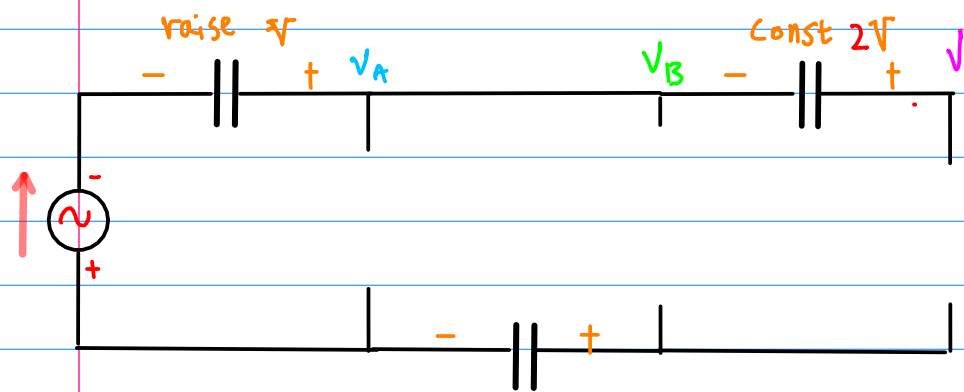
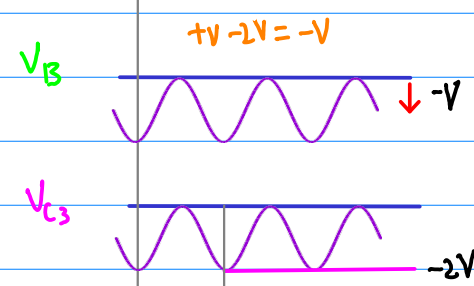
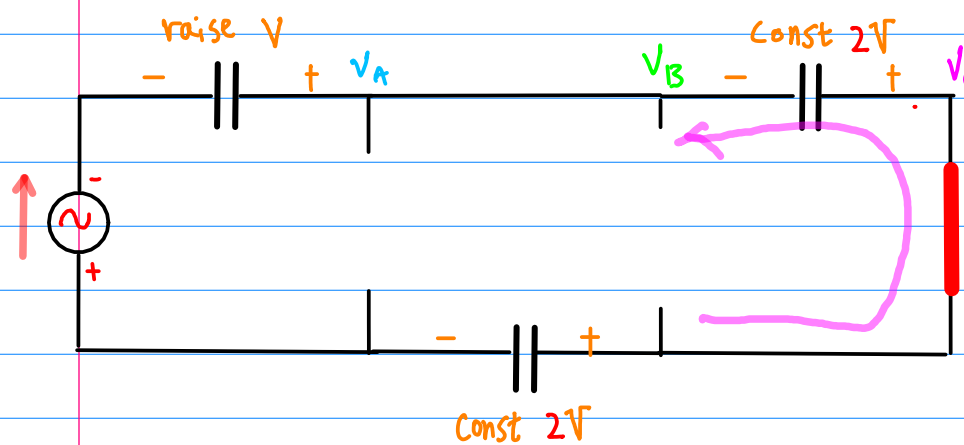
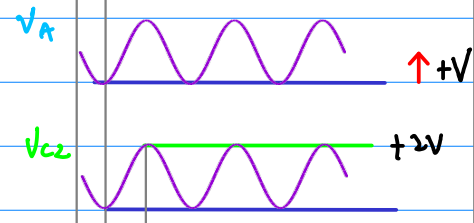
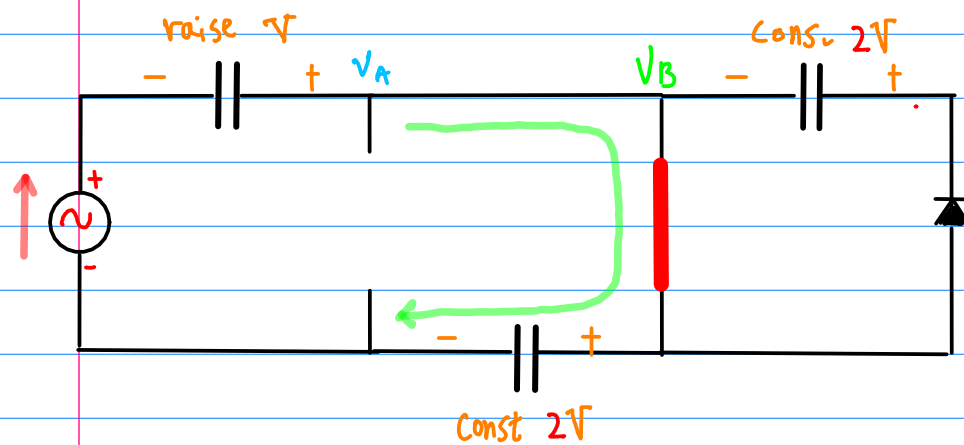
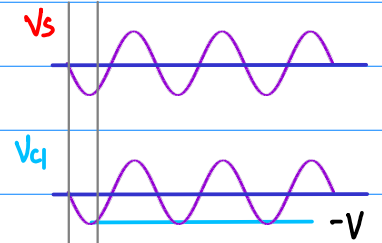
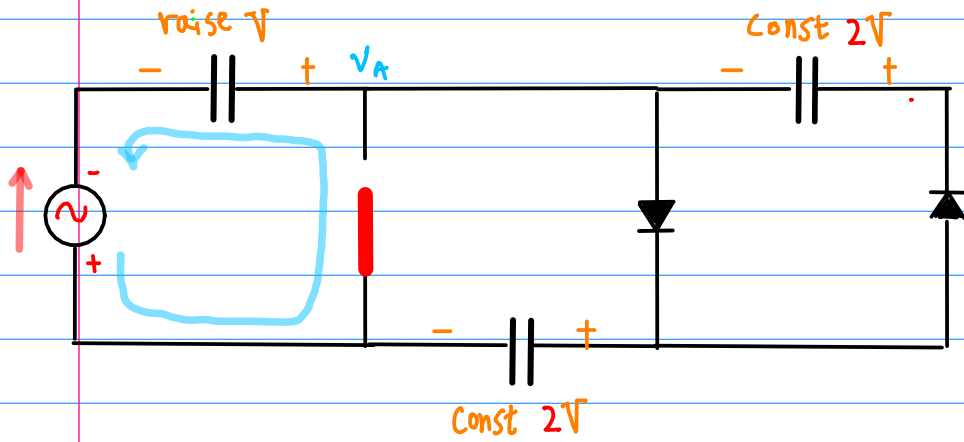
$V_{C1}, V_{C2}, V_{C3}$

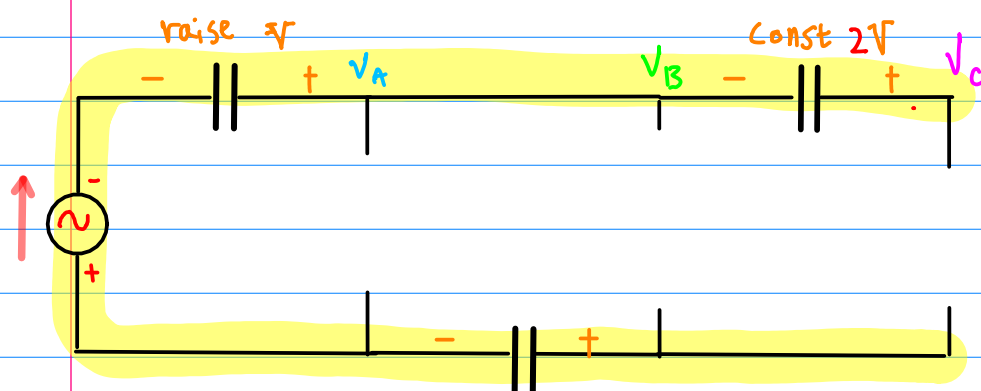
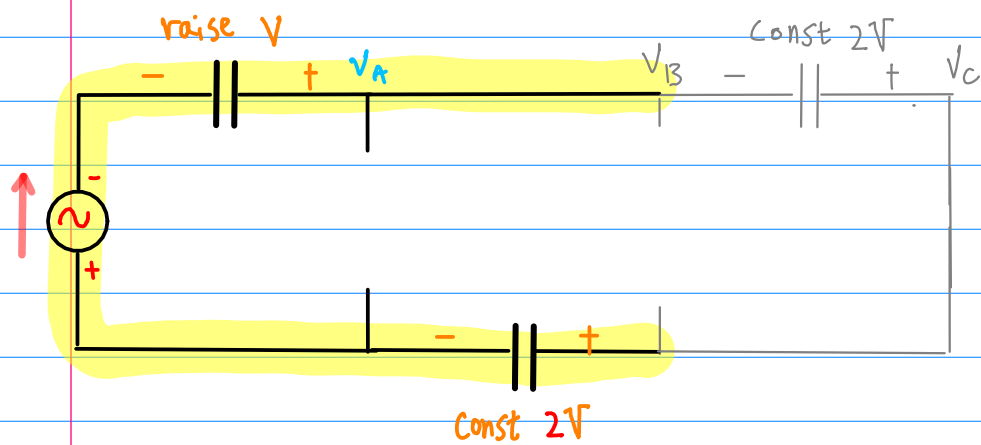
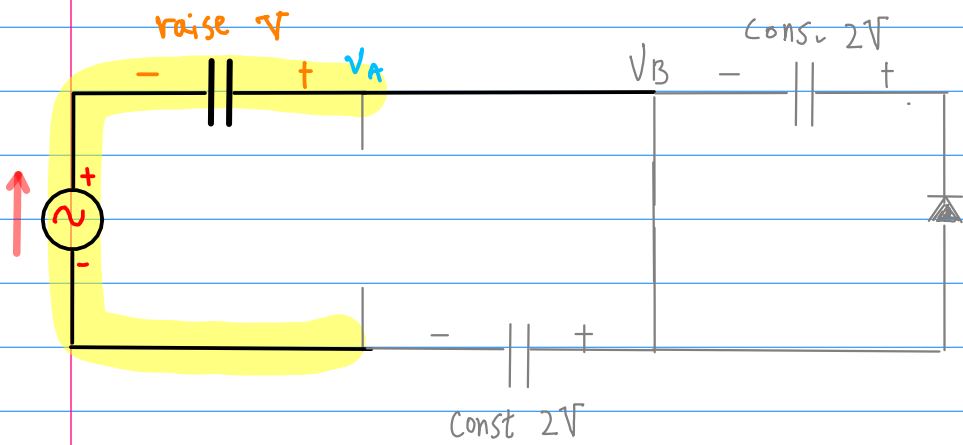
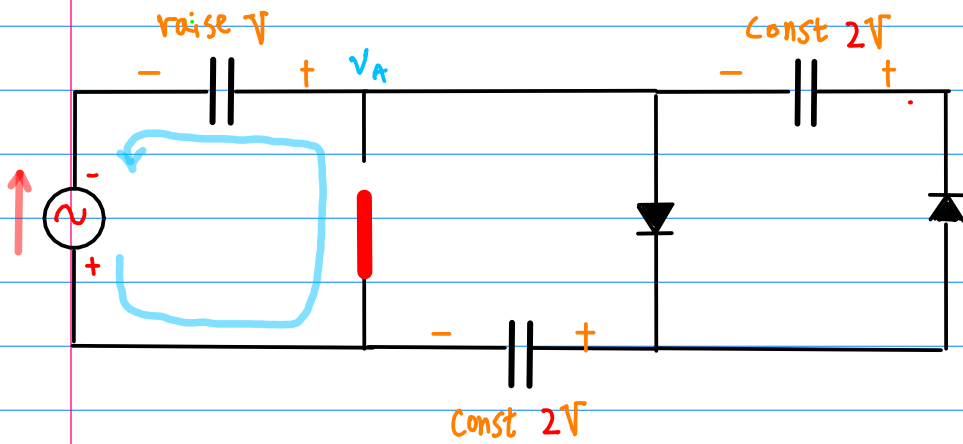


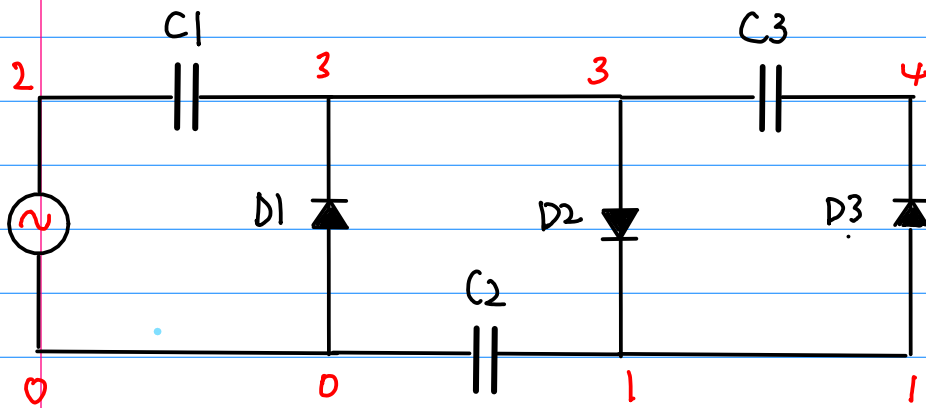
$V_A, V_B, V_C$











\*SPICE tripler.eps

C1 2 3 1000p

C2 0 1 1000p

C3 3 4 1000p

D1 0 3 diode

D2 3 1 diode

D3 1 4 diode

V1 2 0 SIN(0 5 1k)

.model diode d

.tran 0.01m 5m

.end

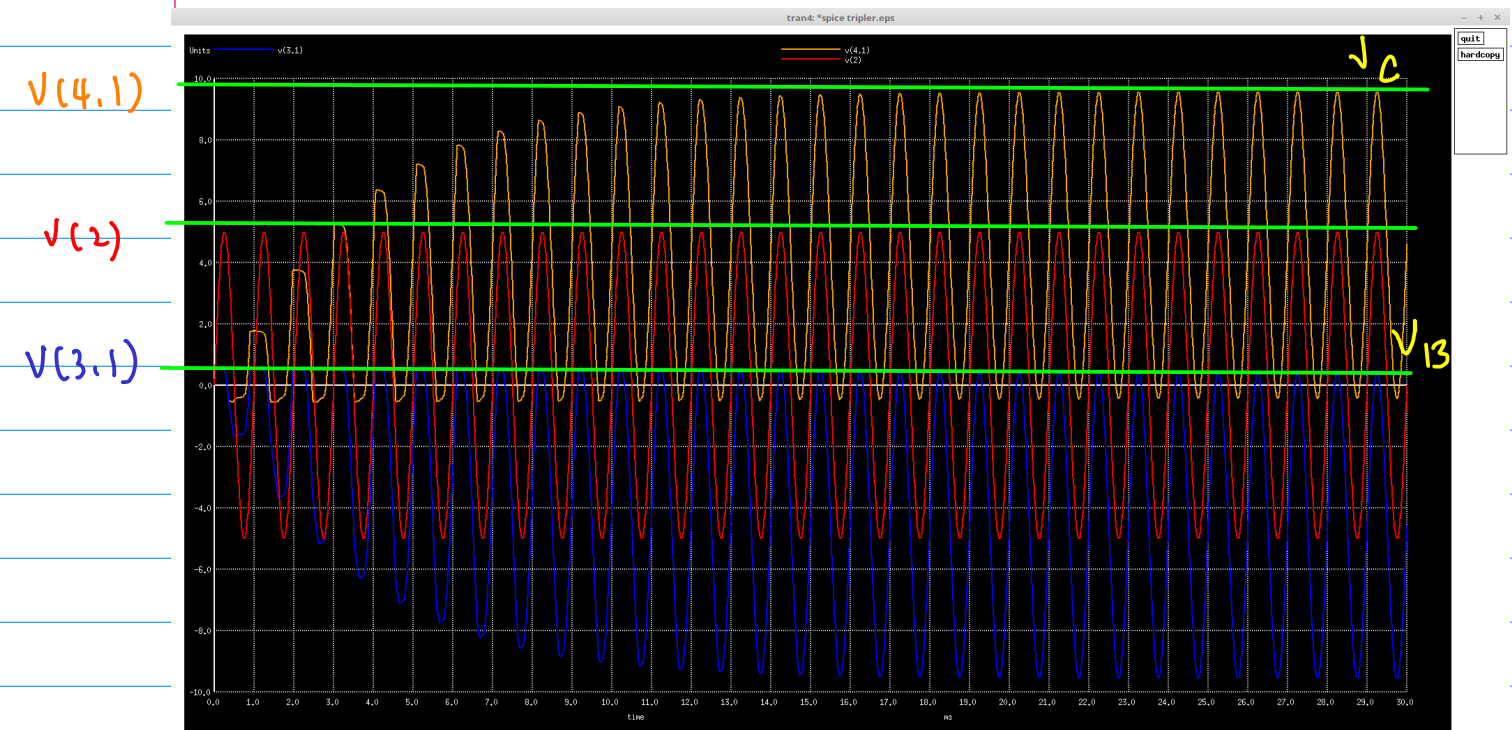
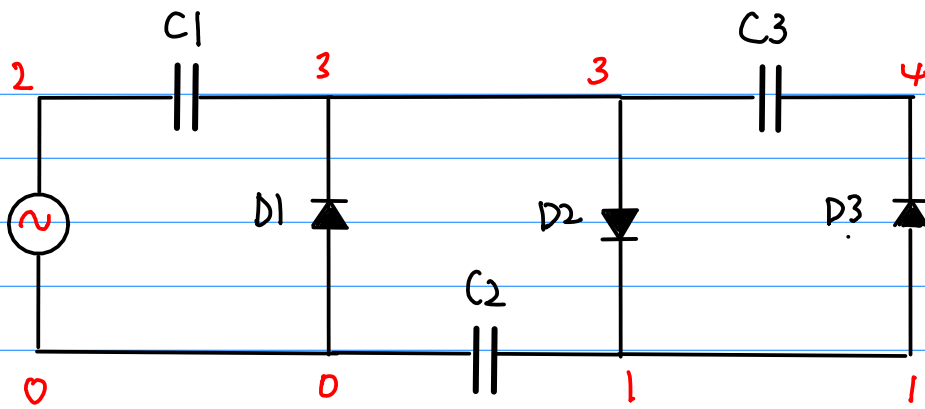
v(3)

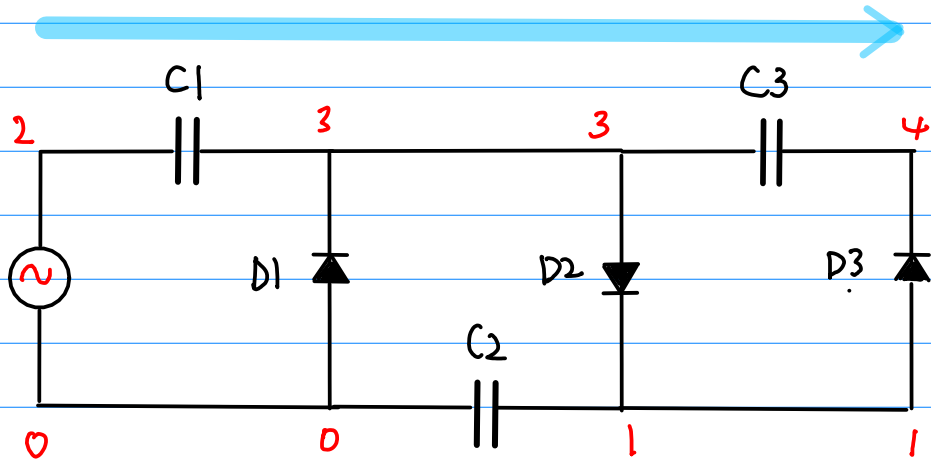
v(2)

v(3,1)

plot v(2), v(3), v(3,1)

plot v(2), v(3,1), v(4,1)





$3 \cdot V_p$

$V_p$

