P

R

D

V_R V_U

V_U

V_R

$V_R + V_\gamma$

S

D

R

V_R

V_U

V_R V_{R+V_γ}

V_{IN}

P

+ R D V_D

V_{IN}

−

D

+ V_R −

V_{IN} − V_R V_D

+

V_O

−

V_O

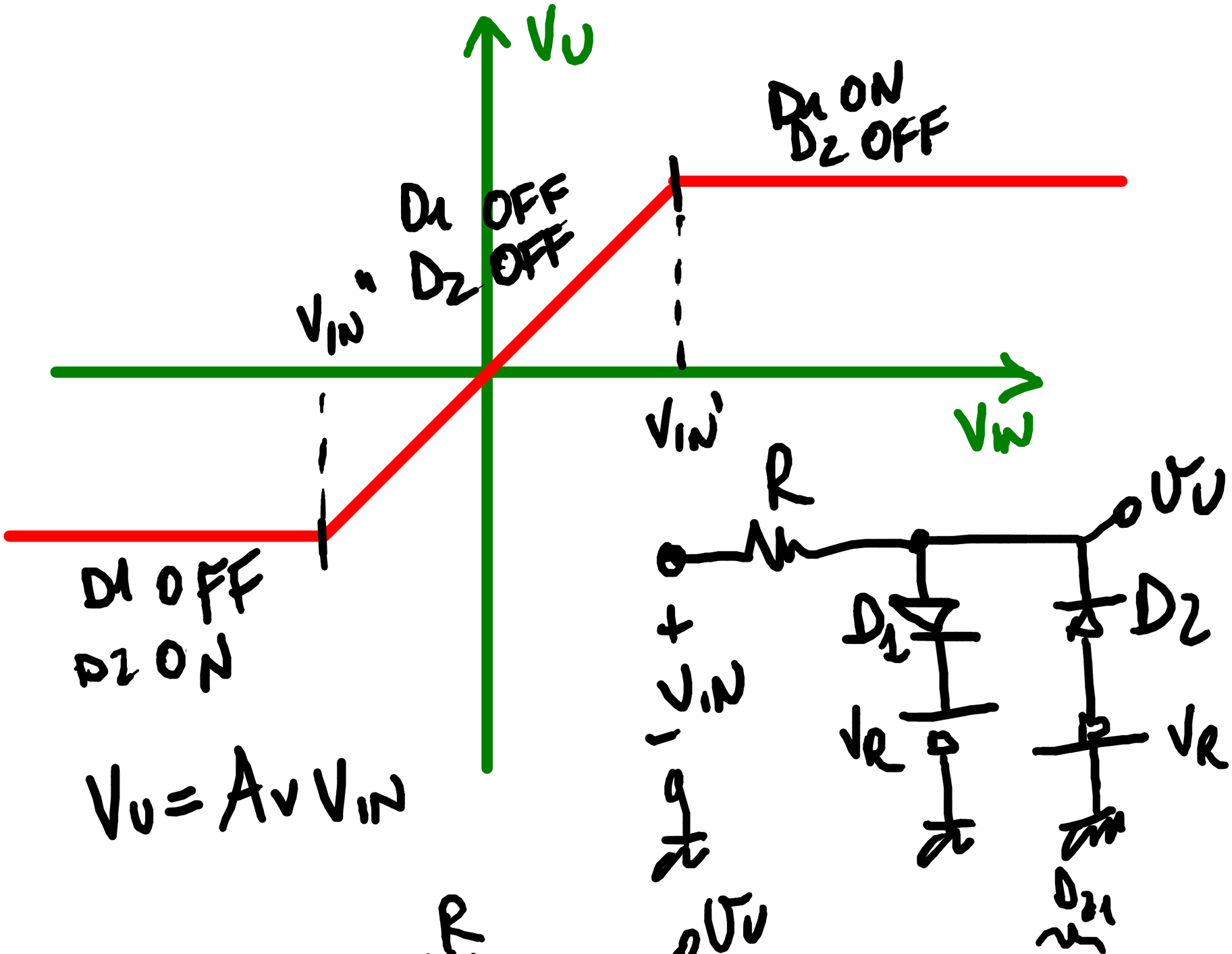
V_{in}

$V_{IN}-V_\gamma$

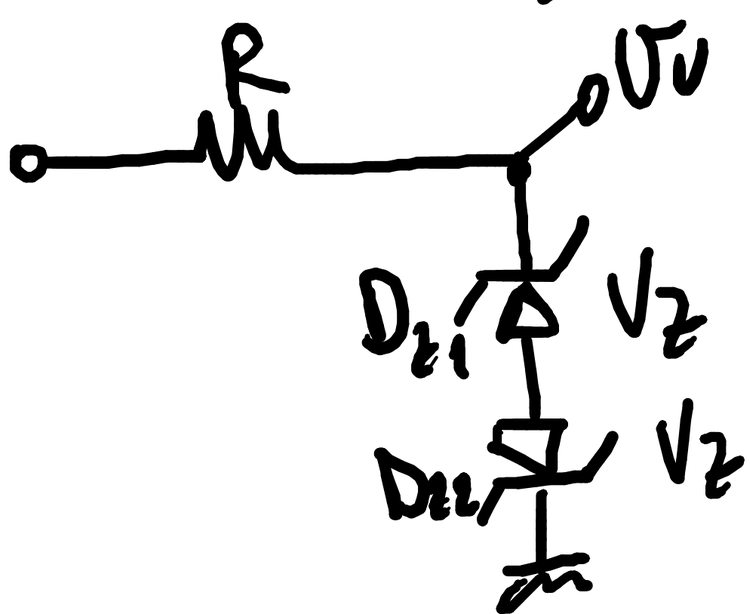
V_{IN}

V_R+V_γ

V_R

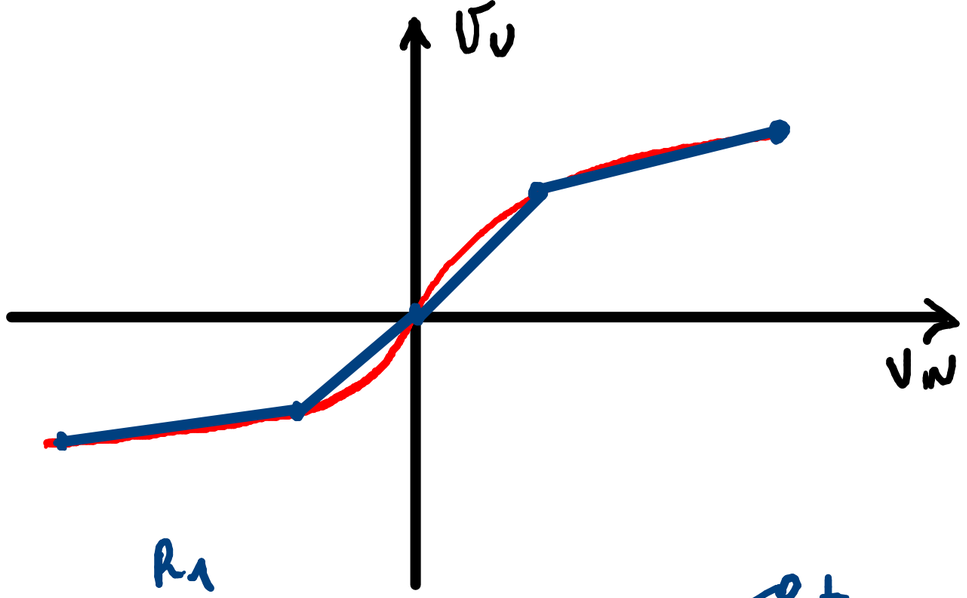


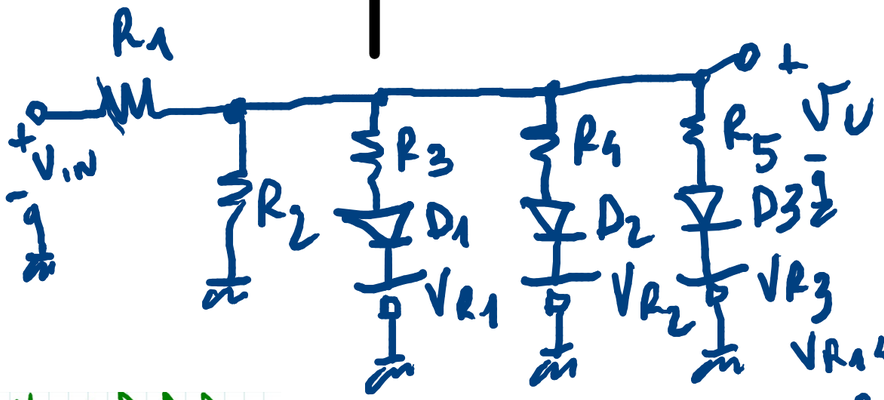
$$V_U = A_V V_{IN}$$



$$V_{UP} = V_Z + V_\gamma$$

$$V_{LOW} = -(V_Z + V_\gamma)$$

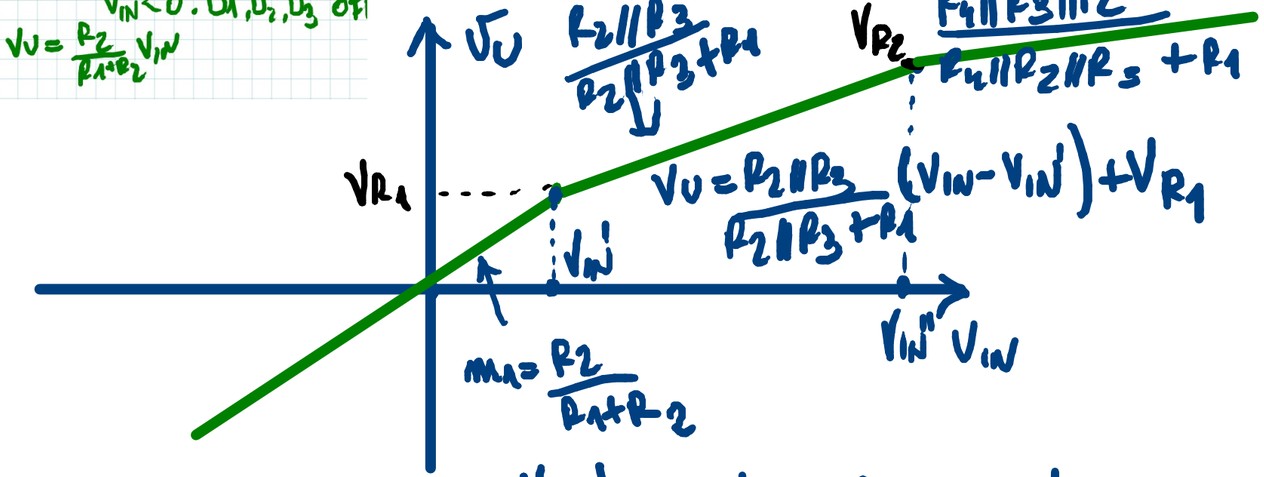




$V_{R1} < V_{R2} < V_{R3}$

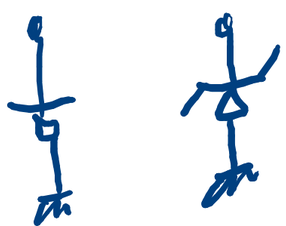
$V_{IN} < 0$: D_1, D_2, D_3 OFF

$V_U = \frac{R_2}{R_1+R_2} V_{IN}$



$$V_{IN}' \Rightarrow V_{R1} = \frac{R_2}{R_2+R_1} V_{IN}'$$

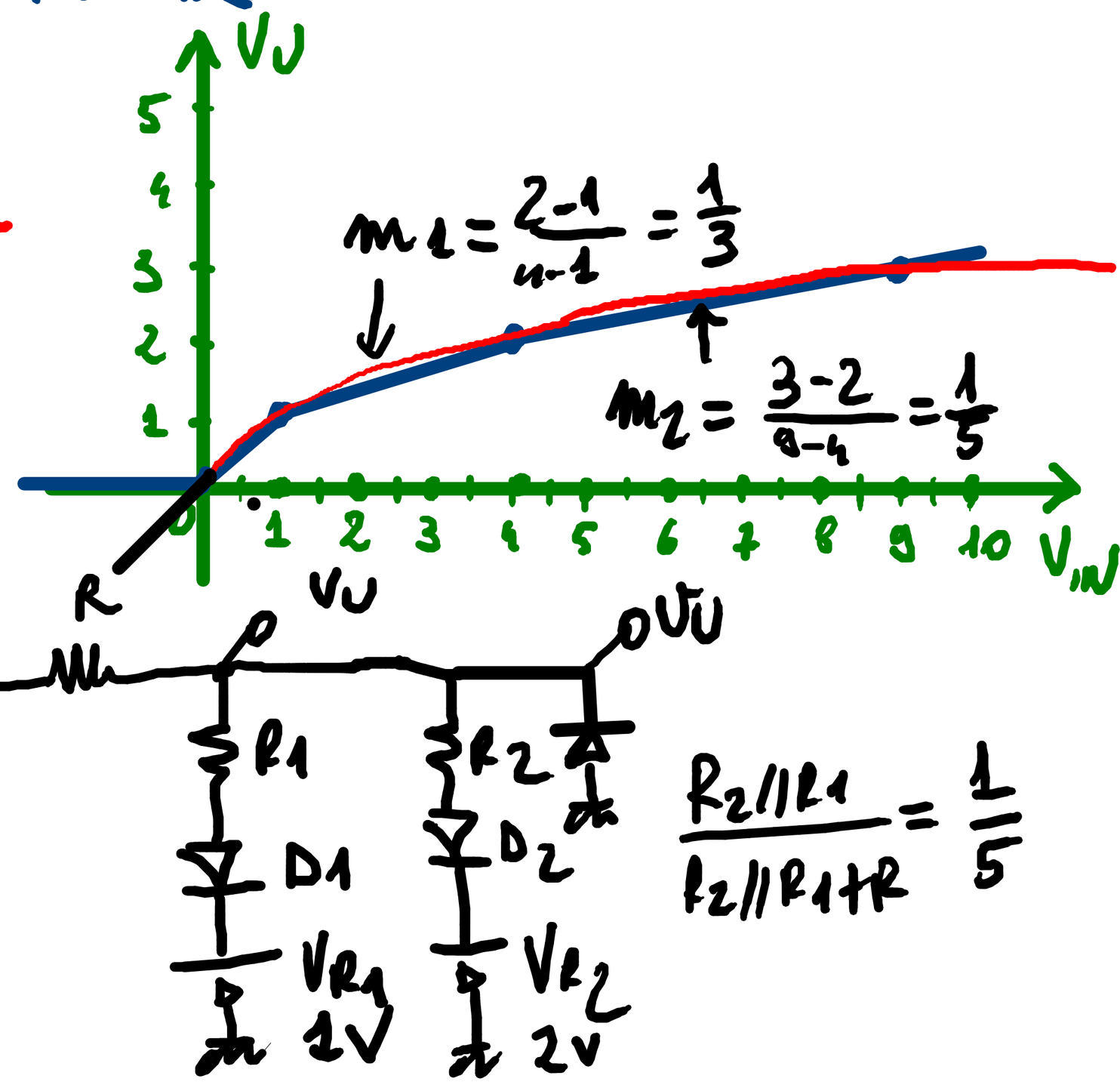
$$V_{IN}' = \frac{R_2+R_1}{R_2} V_{R1}$$



$f(x)=\sqrt{x}$

$-10V \; V_{IN} \leq 10V$

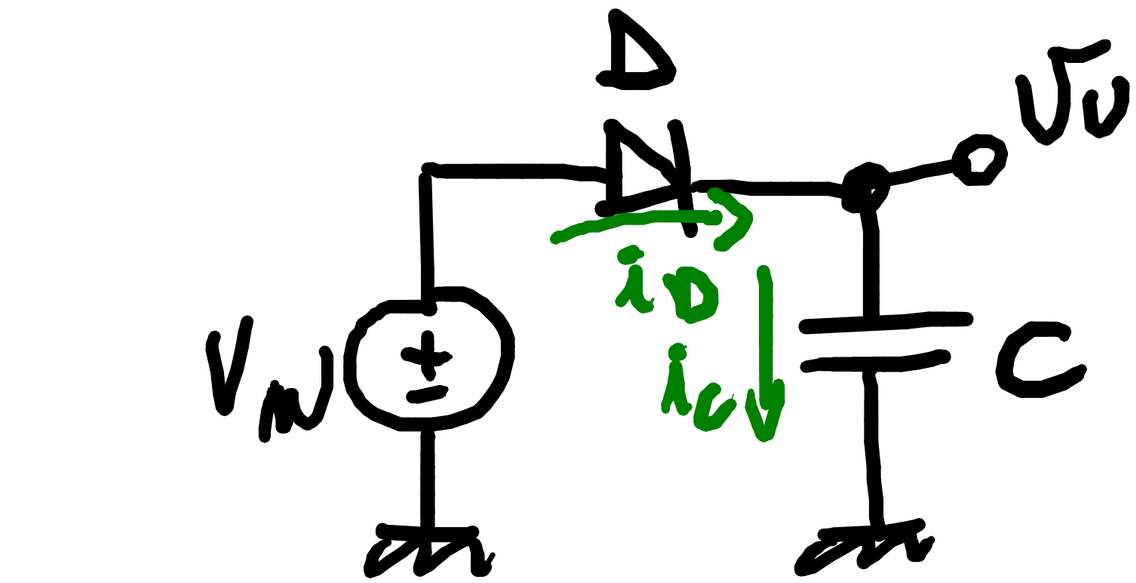
V_{IN}	V_U
1	1
4	2
9	3
<0	0



$$\frac{R1}{R+R1}=\frac{1}{3}$$

$$R1=\frac{R}{2}$$

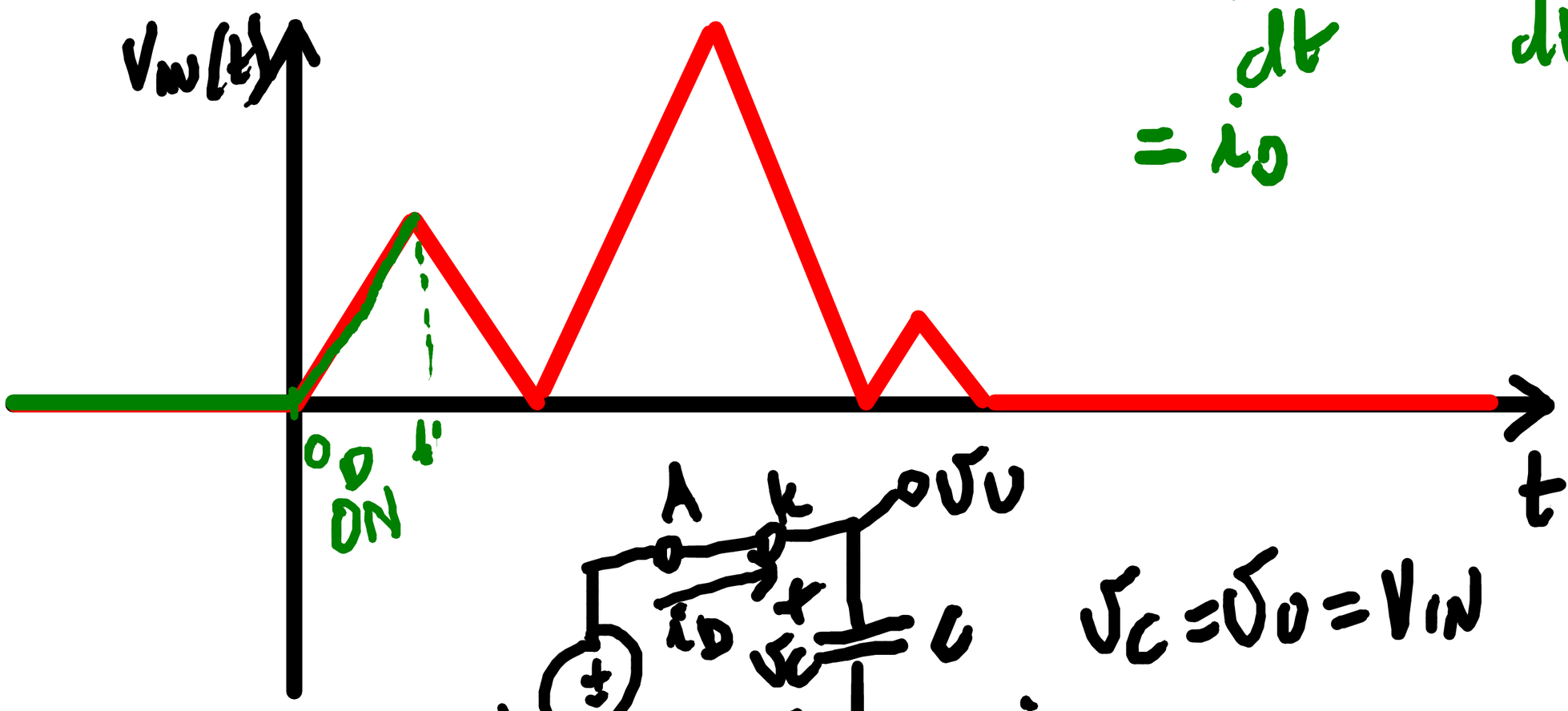
$$\frac{R2//R1}{R2//R1+R}=\frac{1}{5}$$



$$v_C = V_{IN}$$

$$i_C = C\frac{dv_C}{dt} = C\frac{dV_{IN}}{dt} =$$

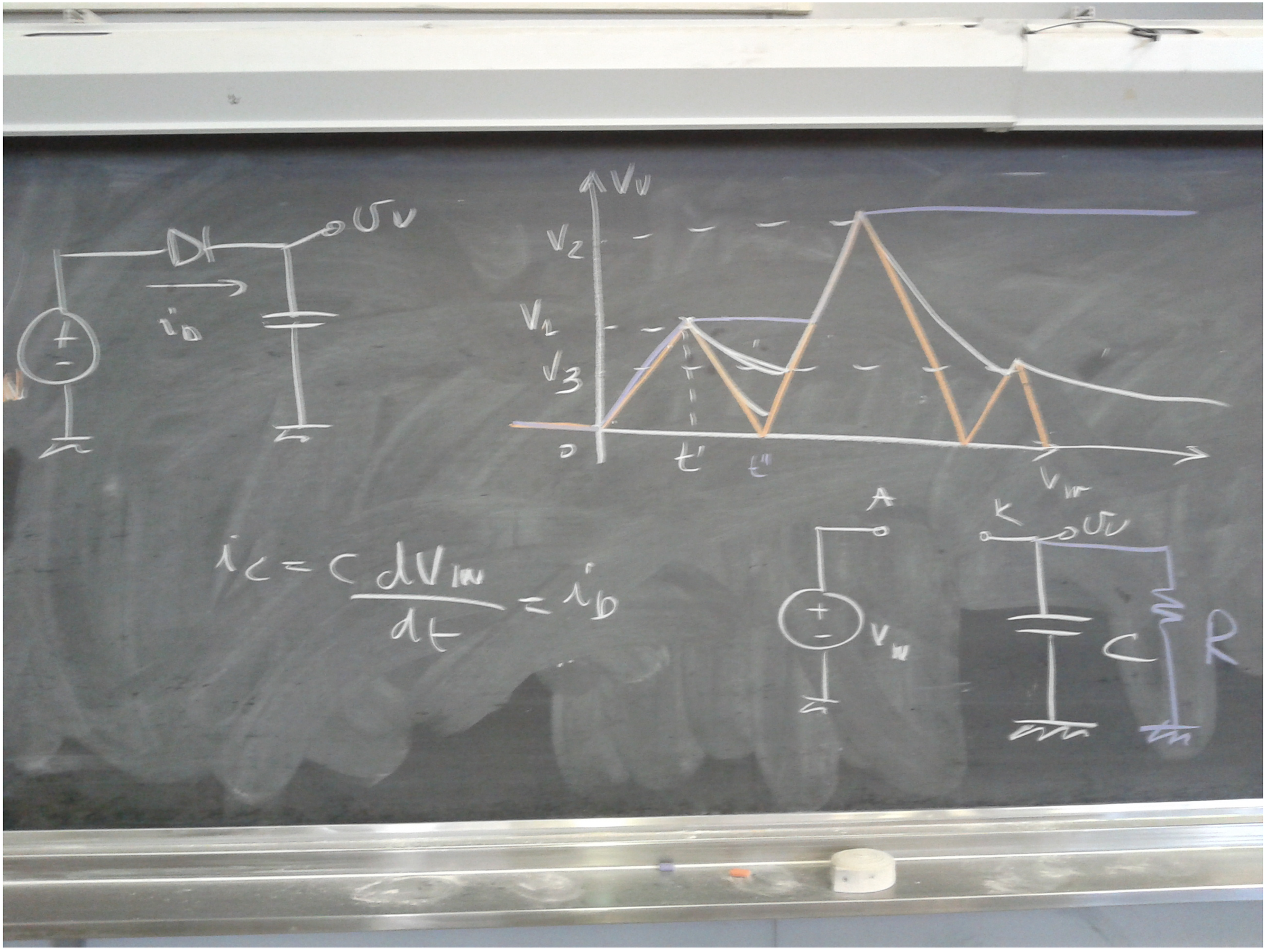
$$= i_D$$



$$v_C = v_D = V_{IN}$$

$$i_D > 0$$

$$i_C = i_D = C\frac{dv_C}{dt} = C\frac{dV_{IN}}{dt} > 0$$


D
i_D
v_V
V_V
V_2
V_1
V_3
0
t'
t''
V_{IN}
A
K
v_V
V_{IN}
C
R
$i_C = C \frac{dV_{IN}}{dt} = i_D$