5.3-5

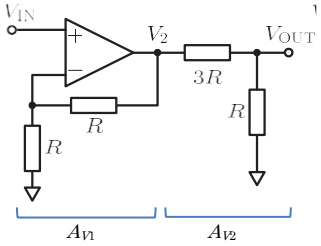
(2)

$$A_{V1}=\frac{V_2}{V_{IN}}=\frac{R}{R}+1=2$$

$$A_{V2}=\frac{V_{OUT}}{V_2}=\frac{R}{3R+R}=\frac{1}{4}$$

$$A_V=\frac{V_{OUT}}{V_{IN}}=A_{V1}A_{V2}=\frac{1}{2}$$

$$G_V=-6\text{dB}$$



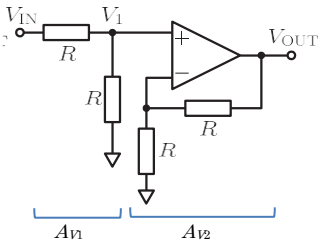
(3)

$$A_{V1}=\frac{V_1}{V_{IN}}=\frac{R}{R+R}=\frac{1}{2}$$

$$A_{V2}=\frac{V_{OUT}}{V_1}=\frac{R}{R}+1=2$$

$$A_V=\frac{V_{OUT}}{V_{IN}}=A_{V1}A_{V2}=1$$

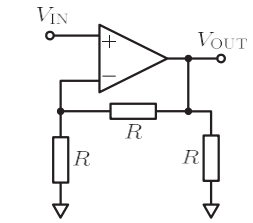
$$G_V=0\text{dB}$$

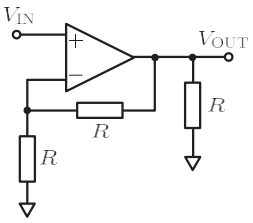


(3)

$$A_V=\frac{V_{OUT}}{V_{IN}}=\frac{R}{R}+1=2$$

$$G_V=6\text{dB}$$



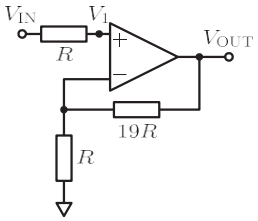


(5)

$V_{\mathrm{IN}} = V_1$

$A_V = \dfrac{V_{\mathrm{OUT}}}{V_{\mathrm{IN}}} = \dfrac{19R}{R} + 1 = 20 = 2 \times 10$

$G_V = 2 + 20 = 26\mathrm{dB}$

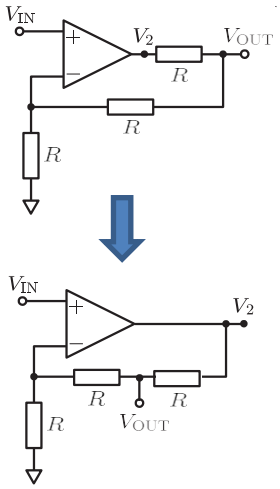


(6)

$A_{V1} = \dfrac{V_2}{V_{\mathrm{IN}}} = \dfrac{2R}{R} + 1 = 3$

$A_V = \dfrac{V_{\mathrm{OUT}}}{V_{\mathrm{IN}}} = \dfrac{\frac{2}{3}V_2}{V_{\mathrm{IN}}} = \dfrac{2}{3}A_{V1} = 2$

$G_V = 6\mathrm{dB}$



(7)

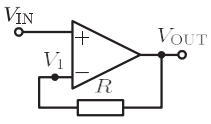
$V_{\mathrm{IN}} = V_1$

Rに電流が流れないので

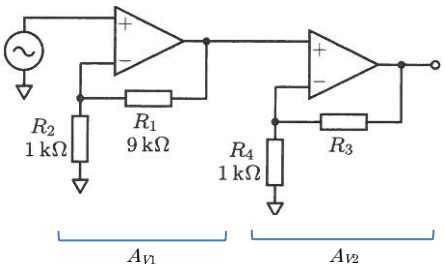
$V_1 = V_{\mathrm{OUT}}$

$A_V = \dfrac{V_{\mathrm{OUT}}}{V_{\mathrm{IN}}} = 1$

$G_V = 0\mathrm{dB}$



5.3-6



Gv=26dB→Av=200

Av_1=10,

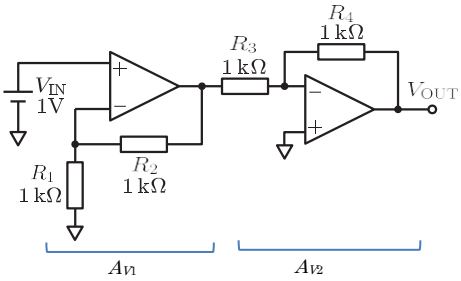
Av= Av_1 Av_2

Av_2= Av/ Av_1=20

Av_2=R_3/R_4+1

R_3= R_4 (Av_2−1)=19k Ω

5.4-3



(1)

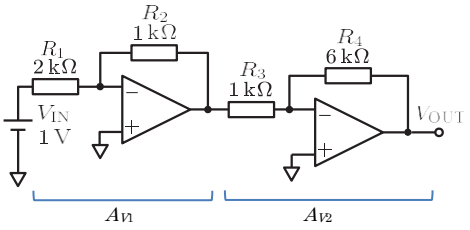
Av_1= R_2/R_1+1=2

Av_2= −R_4/R_3= −1

Av= Av_1 Av_2= −2

V_{OUT}= Av V_{IN} = −2V

Gv=6dB



(2)

Av_1= −R_2 /R_1= −1/2

Av_2= −R_4/R_3= −6

Av= Av_1 Av_2= 3

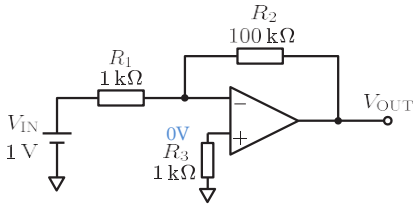
V_{OUT}= Av V_{IN}= 3V

Gv=10dB

(3)

非反転入力端子に加わる電圧は，0V であり，

図 5.29 と同様の回路として考える．



Av= −R_2 /R_1= −100

V_{OUT}= Av V_{IN}= −100V

|Av|=100=10×10

Gv=20+20=40dB

(4)

バーチャルショートにより，

反転入力端子の電圧は0Vである．

従って，R_3に流れる電流は0Aであり，

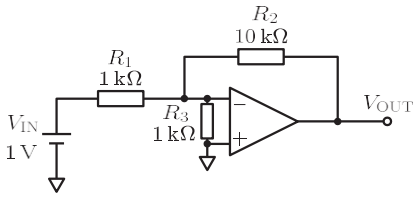
R_3は，取り外して考えることができる．

$Av = -R_2/R_1 = -10$

$V_{OUT} = Av\ V_{IN} = -10V$

$|Av| = 10$

$Gv = 20dB$



(5)

テブナンの定理を用いて回路を変形

$Av' = -R_4/(R'+R_3) = -1$

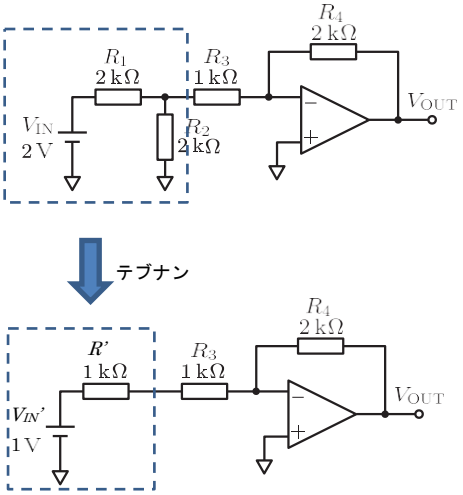
$R' = R_1//R_2 = 1k\,\Omega$

$V_{IN}' = V_{IN}/2 = 1V$

$V_{OUT} = Av'\,V_{IN}' = -1V$

$Av = V_{OUT} / V_{IN} = -1/2$

$Gv = -6dB$



5.5-3

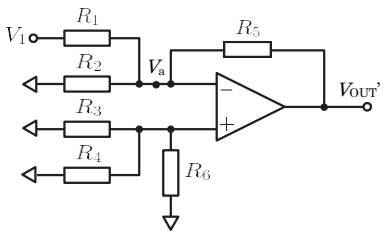
5.5-1 より　$V_{OUT} = -(R_3V_1/R_1 + R_3V_2/R_2)$

$R_3/R_2 = 3$ より，　$R_3 = 3R_2 = 3k\Omega$

$R_3/R_1 = 2$ より，　$R_1 = R_2/2 = 1.5k\Omega$

5.5-6

重ね合わせの理を用いて解く



＜V_1のみで考える＞

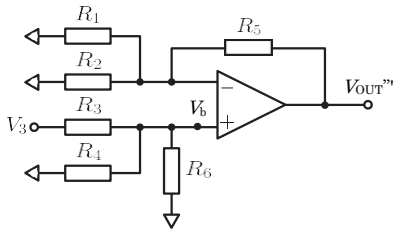
イマジナリーショートよりV_a=0Vのため，R_2は無視できる．

$V_{OUT}' = -R_5 V_1/R_1 = -V_1$

＜V_2のみで考える＞

$V_{OUT}'' = -R_5 V_2/R_2 = -V_2$

＜V_3のみで考える＞



$$V_b = \frac{(R_4 // R_6)}{R_3 + (R_4 // R_6)} V_3 = \frac{1}{3} V_3$$

$$V_{OUT}''' = \left(\frac{R_5}{R_1 // R_2} + 1 \right) V_b = 3V_b = V_3$$

＜V_4のみで考える＞

V_3と同様に考えると

$V_{OUT}'''' = V_4$

$V_{OUT} = V_{OUT}' + V_{OUT}'' + V_{OUT}''' + V_{OUT}'''' = -V_1 - V_2 + V_3 + V_4$

5.5-7

重ね合わせの理で考える

＜V_0のみで考える＞　V_0=1V のとき　$V_{OUT}' = -R_4 V_0/R_1 = -1V$

V_0=0Vのとき　$V_{OUT}' = 0V$

＜V_1のみで考える＞　V_1=1Vのとき　$V_{OUT}'' = -R_4 V_1/R_2 = -2V$

V_1=0Vのとき　$V_{OUT}'' = 0V$

＜V_2のみで考える＞　V_2=1Vのとき　$V_{OUT}''' = -R_4 V_2/R_3 = -4V$

V_2=0Vのとき　$V_{OUT}''' = 0V$

$V_{OUT} = V_{OUT}' + V_{OUT}'' + V_{OUT}'''$