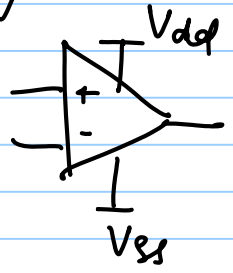
EE2019 Analog Systems & Lab

Note Title 2/11/2020

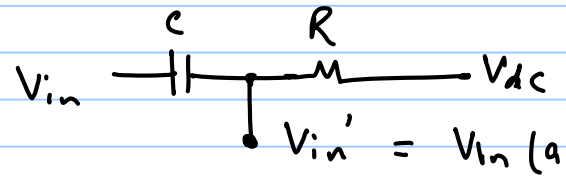
AC coupling

① dc operating point should be $= \frac{V_{dd}+V_{ss}}{2}$ → common mode voltage or dc bias



$V_{in} = V_{ac} + V_{dc}$

$V_{out} = K V_{ac} + V_{dc}$



$R >> \frac{1}{\omega C}$

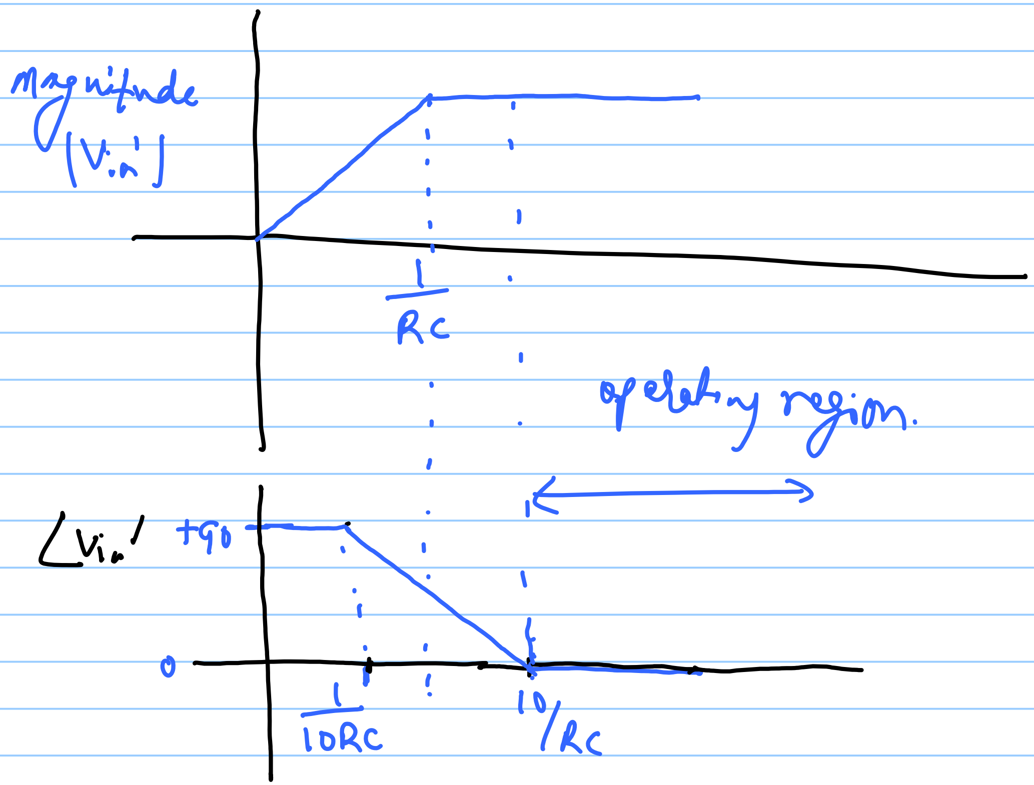
C → decouples dc & couples only ac

R → Sets the dc bias at V_{in}

$R >> \frac{1}{\omega C}$ → usually this condition should be met for all frequency contents in the signal

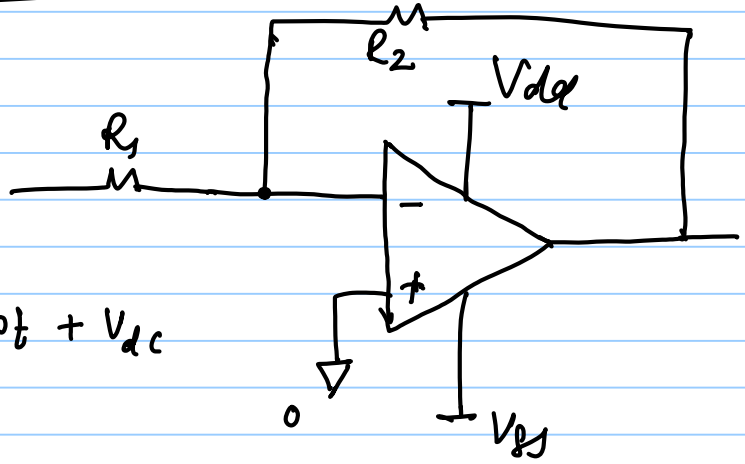
assume V_{in} → 1 kHz → 10 kHz

$$R >> \frac{1}{(2\pi\, 1\,\text{kHz})\, C}$$


magnitude
$|V_{in}'|$
$\frac{1}{RC}$
operating region.
$\angle V_{in}'$
+90
0
$\frac{1}{10RC}$
$10/RC$

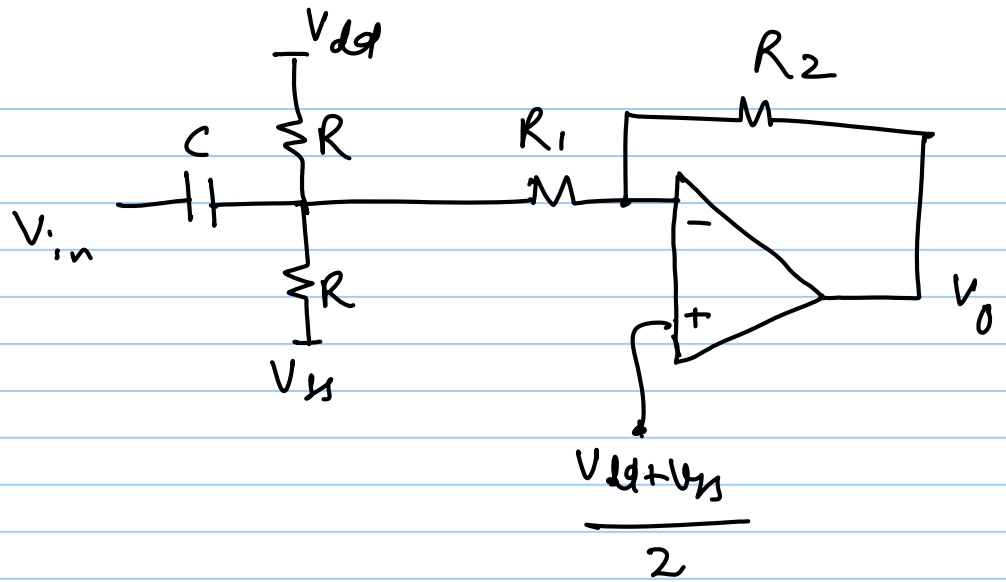
$R > \frac{10}{RC}$

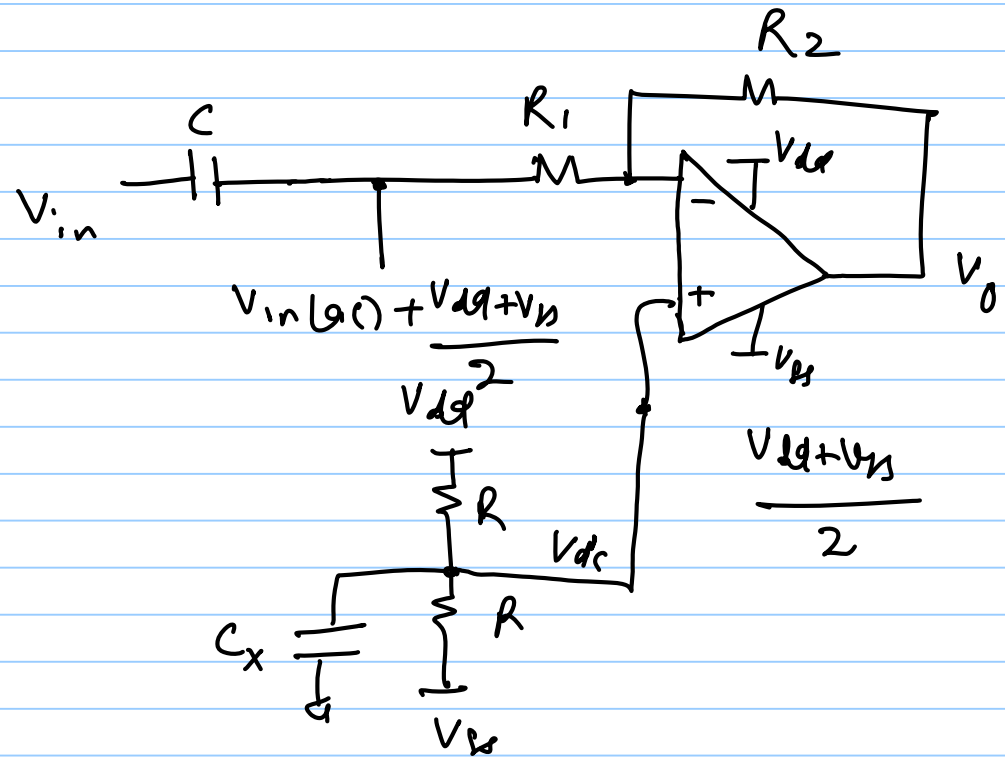
Biasing of an inverting amplifier

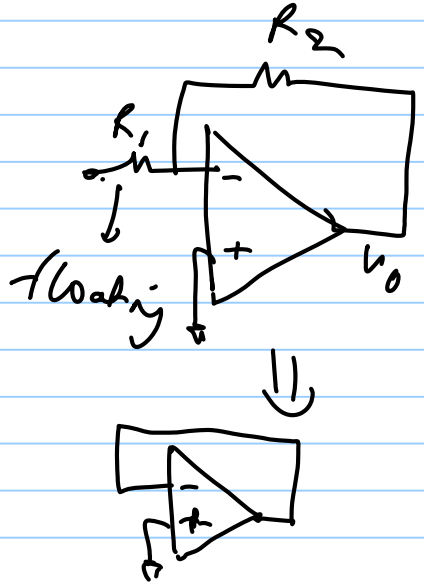


$$V_o = -\frac{R_2}{R_1} V_{in}, \quad \text{dc level is 0}$$

$$V_{dc} = \frac{V_{dd}+V_{ss}}{2}$$


V_{dd}
R
C
R_1
R_2
V_{in}
R
V_{ss}
V_o
$\frac{V_{dd}+V_{ss}}{2}$


R2
C
R1
Vin
Vdd
Vo
Vss
Vin(avg) + (Vdd+Vss)/2
Vdd/2
R
Vdc
(Vdd+Vss)/2
R
Cx
Vss


R2
R1
Vo
Rload