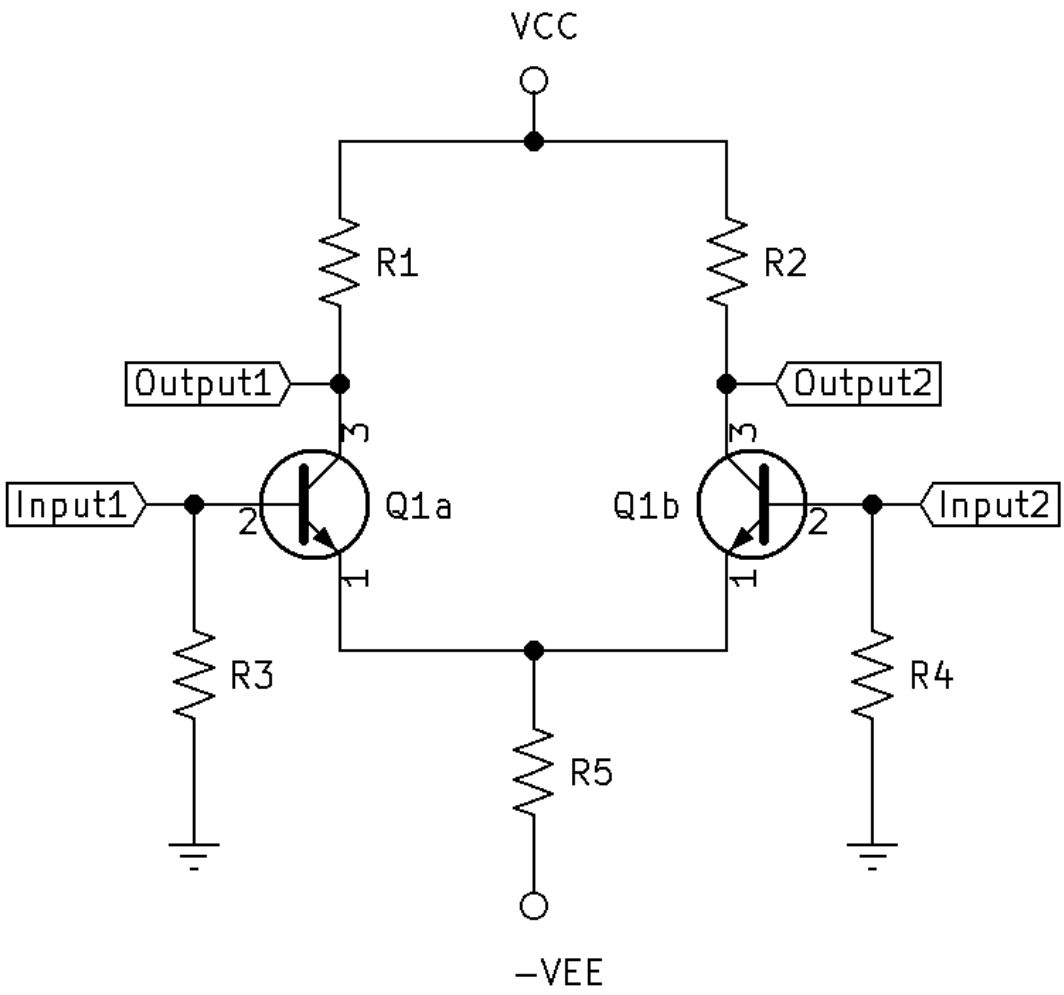
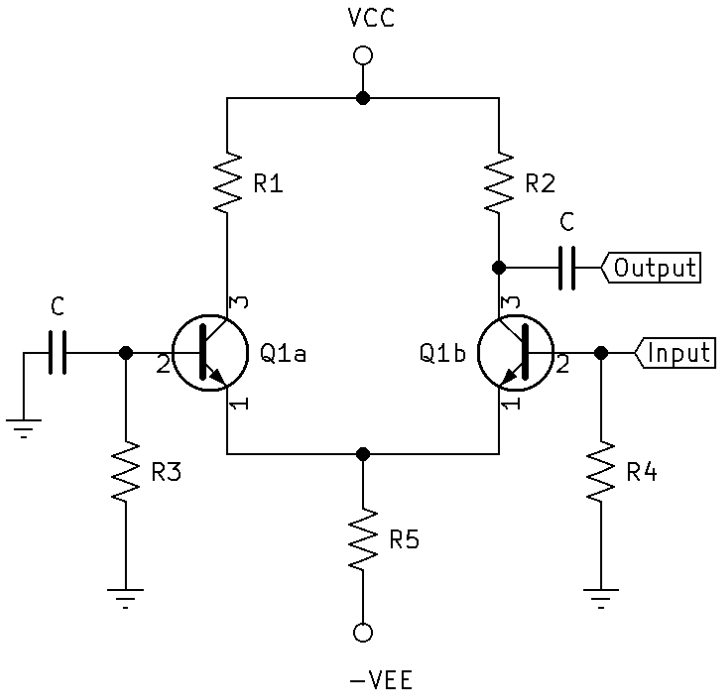


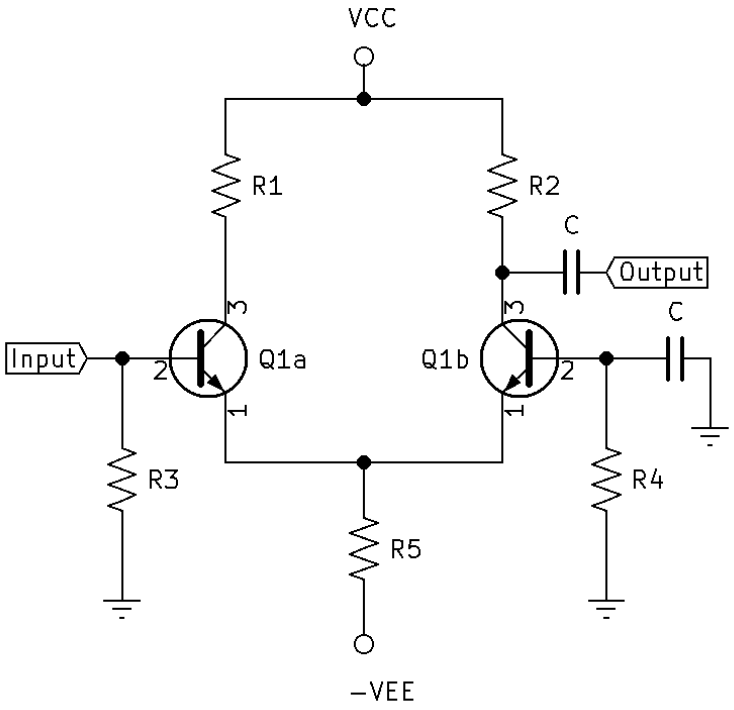
- A <u>Differential Amplifier</u> is an amplifier that produces outputs that are a function of the differnece between two inputs.
- Transistors are Beta matched.
- RCs are equal, (R1=R2)
- RBs are equal, (R3=R4)
- IR5 is equal to $2 \times IE$.

- Single-Ended Differential Input: The Diff-Amp is operated with one input grounded and signal voltage is applied to the other input.

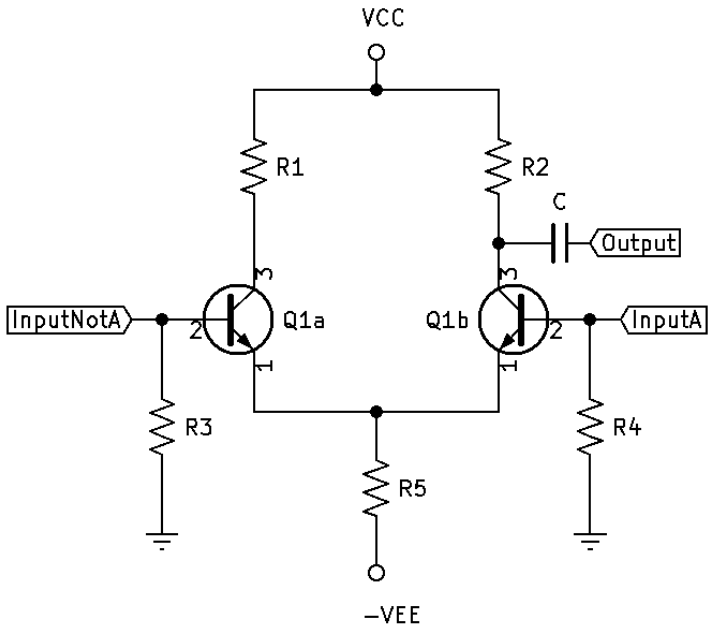
    - Below is an example of Single-Ended Differential Input Inverting Amplifier.



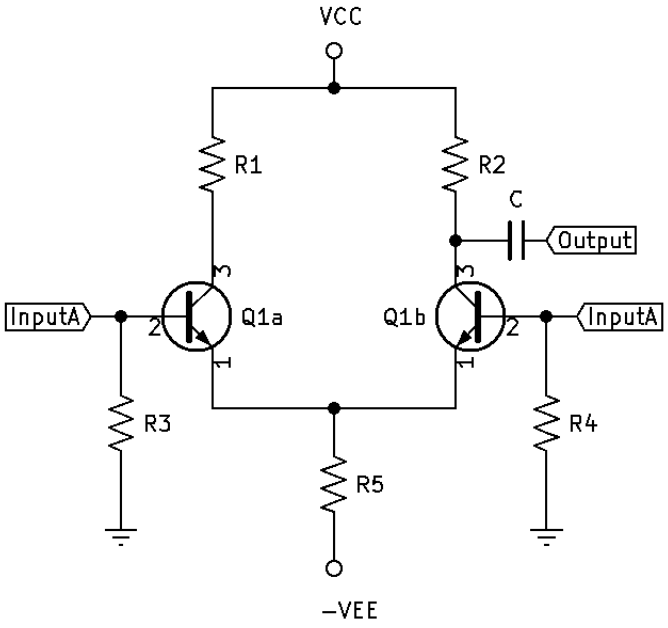
    - Below is an example of Single-Ended Differential Input Non-Inverting Amplifier.



- Double-Ended Differential Inputs: Two 180° out of phase signals with the same amplitude and frequency are applied to the inputs. The gain resultant is $2 \times \Delta v$.

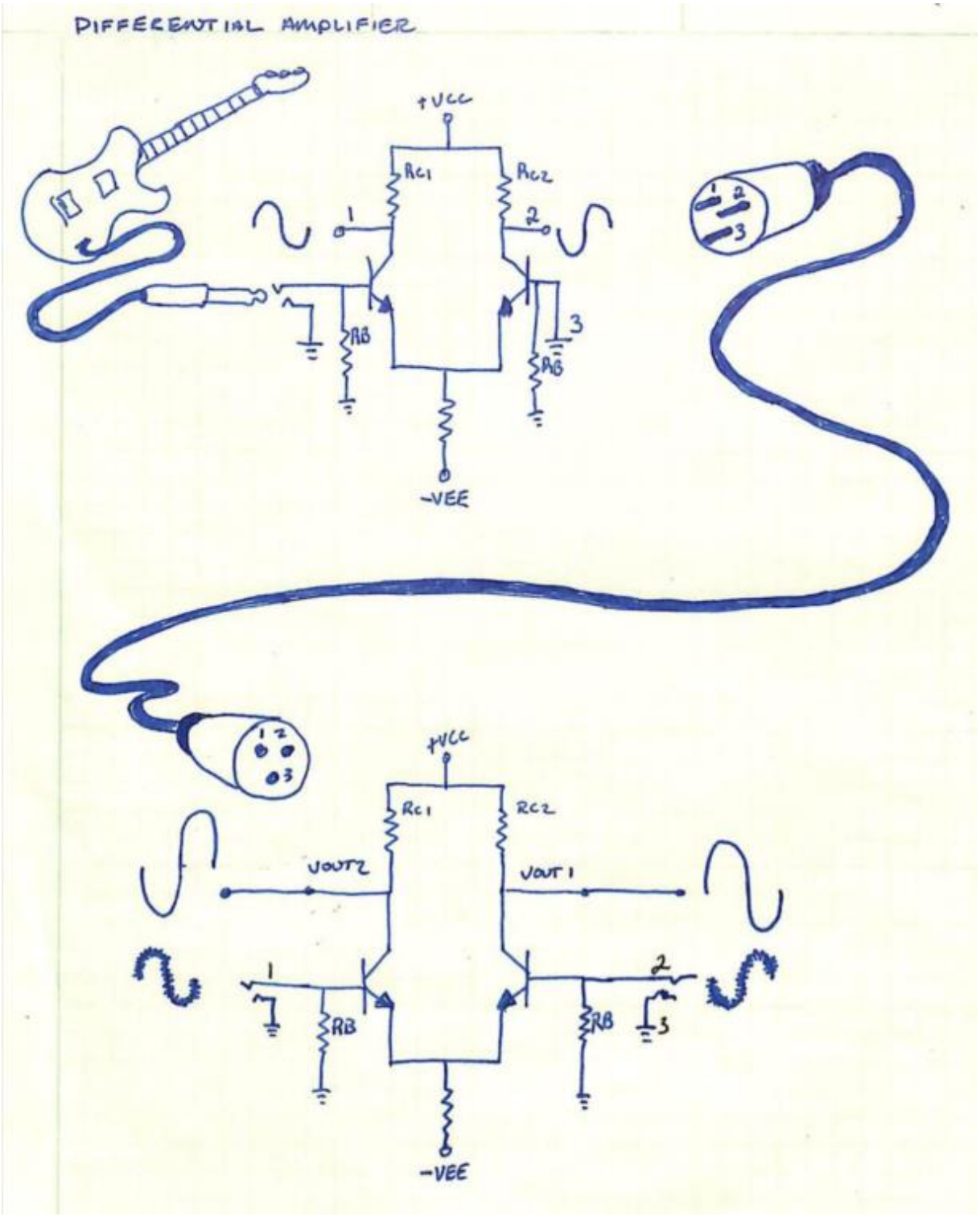


- Common-Mode: Two in-phase signals with the same amplitude and frequency are applied to the inputs. The gain resultant is $\Delta v \approx 0$.



- CMRR (Common-Mode Rejection Ration):The measure of an amplifers ability to reject Common-Mode signals.

- $CMRR_{dB} = 20Log(\frac{\Delta vcm}{\Delta vdiff})$


DIFFERENTIAL AMPLIFIER
+VCC
RC1
RC2
1
2
3
RB
RB
-VEE
+VCC
RC1
RC2
VOUT2
VOUT1
1
2
RB
RB
3
-VEE