BJT Bias
Operating Point (H.4)

20170117

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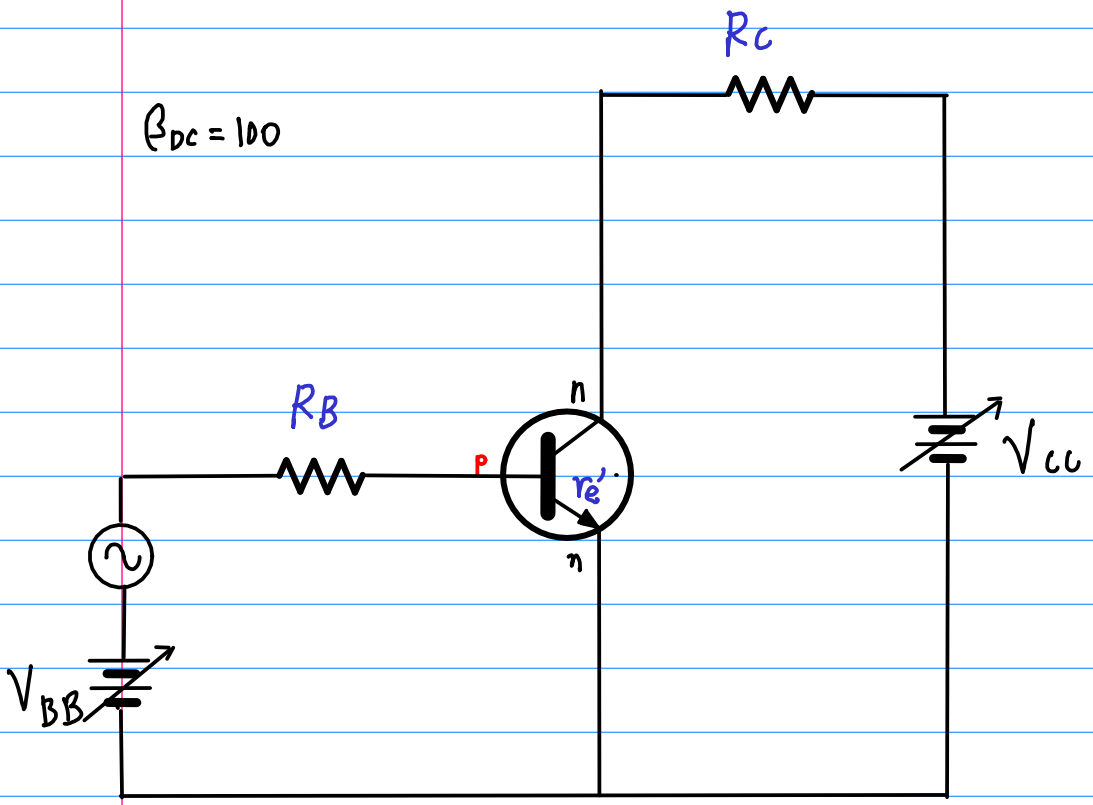
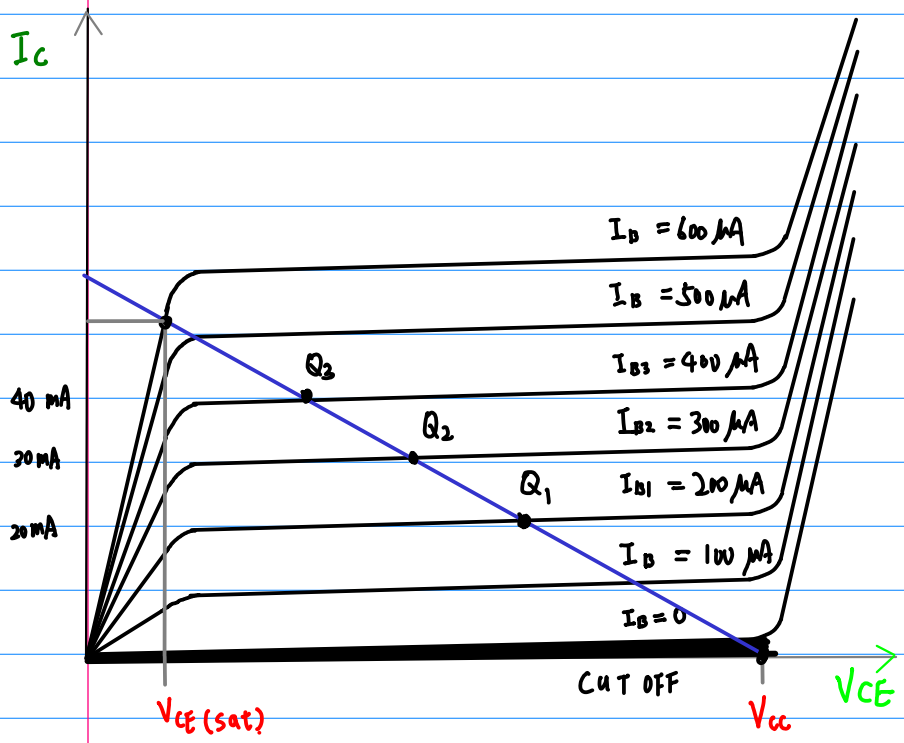
References

Based

[1] Floyd, Electronic Devices 7th ed
[2] Cook,

[2] en.wikipedia.org



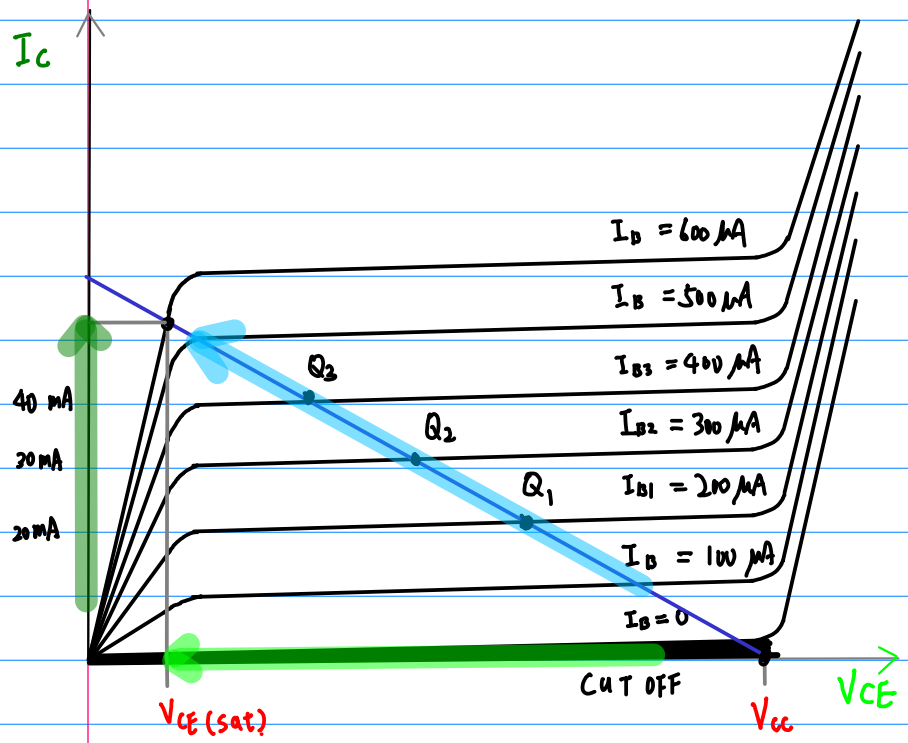


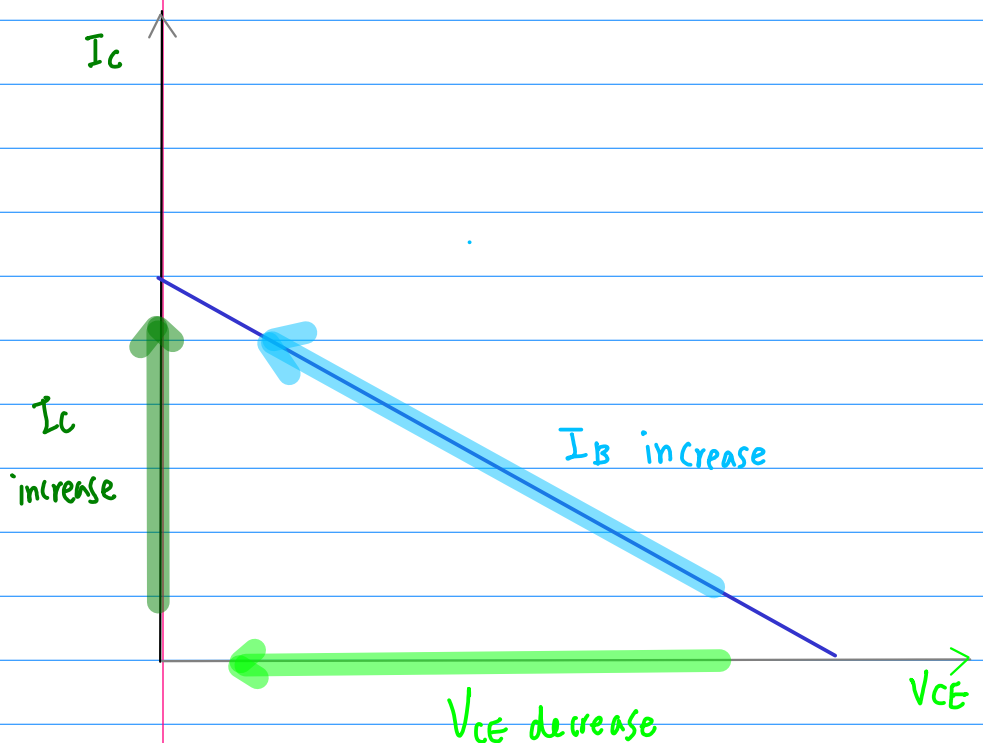
$\beta_{DC} = 100$

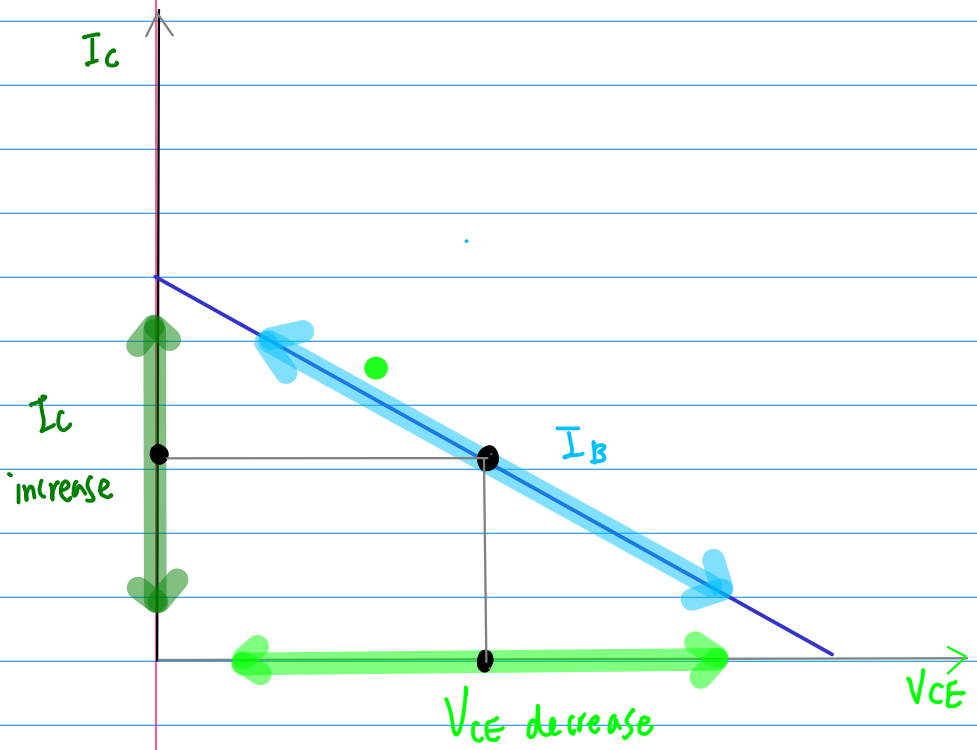
$I_{B3} = 400\,\mu A \xrightarrow{*100} I_{C3} = 40\,mA$

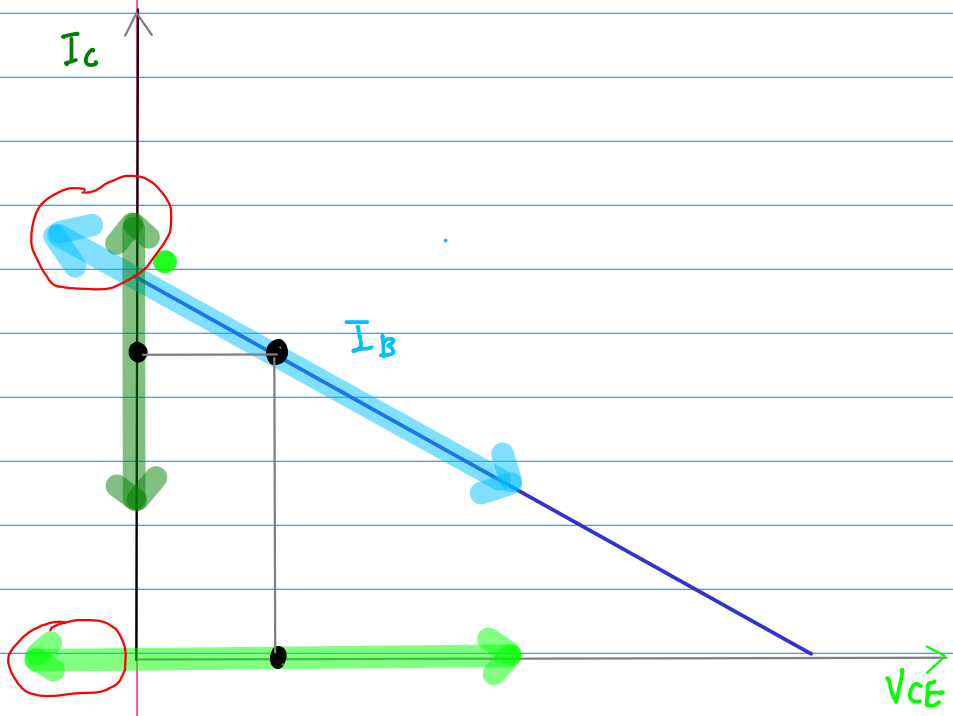
$I_{B2} = 300\,\mu A \xrightarrow{*100} I_{C2} = 30\,mA$

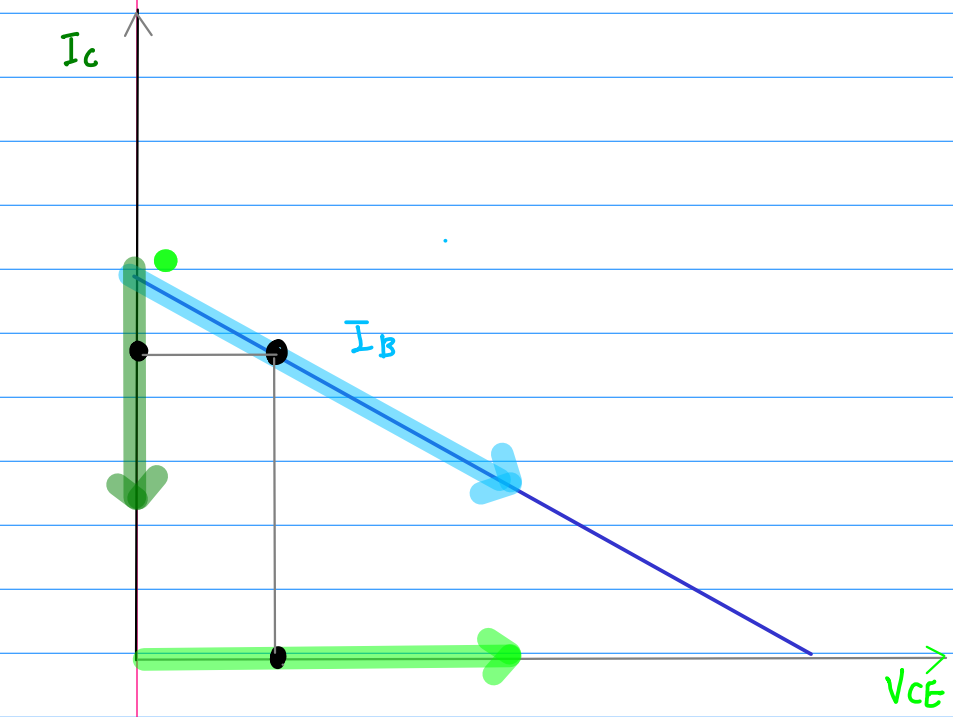
$I_{B1} = 200\,\mu A \xrightarrow{*100} I_{C1} = 20\,mA$

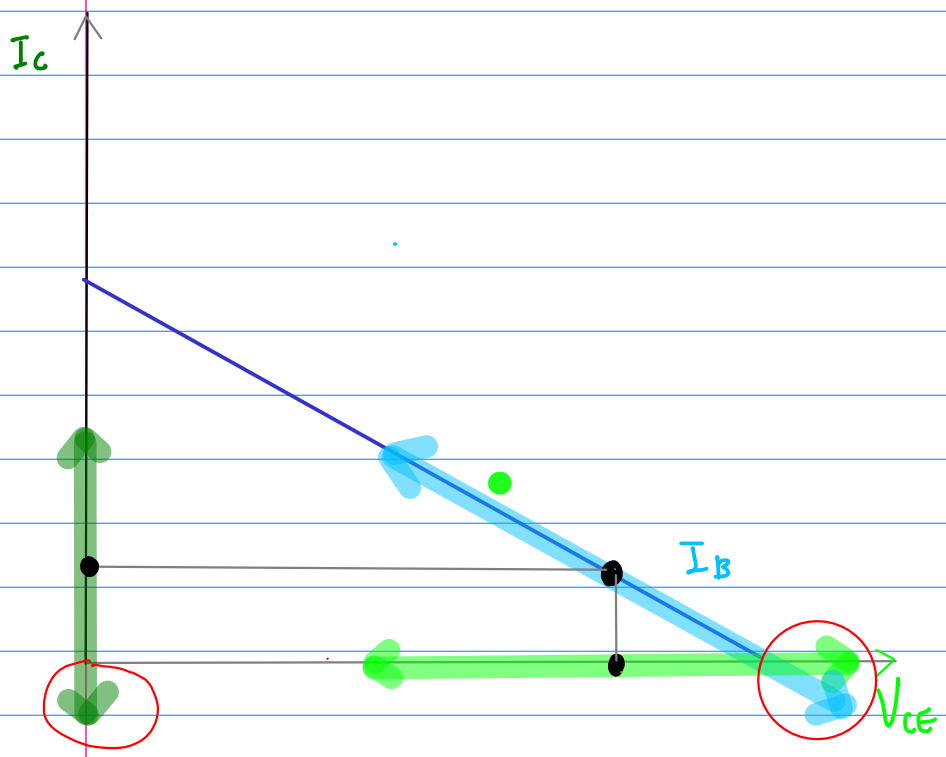

I_C
$I_B = 600\,\mu A$
$I_B = 500\,\mu A$
$I_{B3} = 400\,\mu A$
$I_{B2} = 300\,\mu A$
$I_{B1} = 200\,\mu A$
$I_B = 100\,\mu A$
$I_B = 0$
Q_3
Q_2
Q_1
40 mA
30 mA
20 mA
$V_{CE(sat)}$
CUT OFF
V_{cc}
V_{CE}

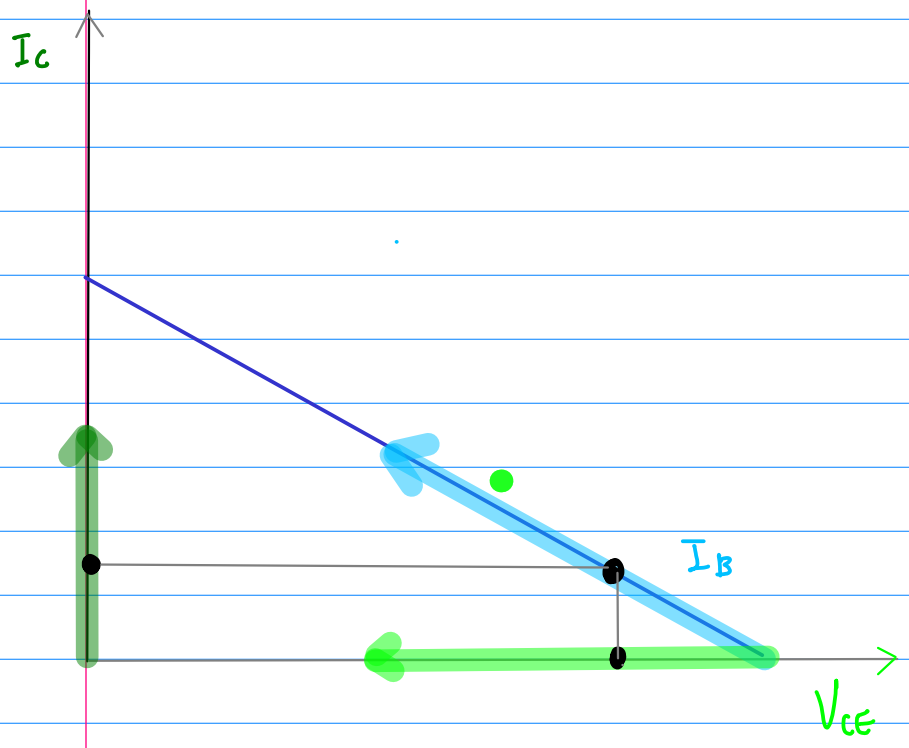

I_C
I_C increase
I_B increase
V_{CE} decrease
V_{CE}

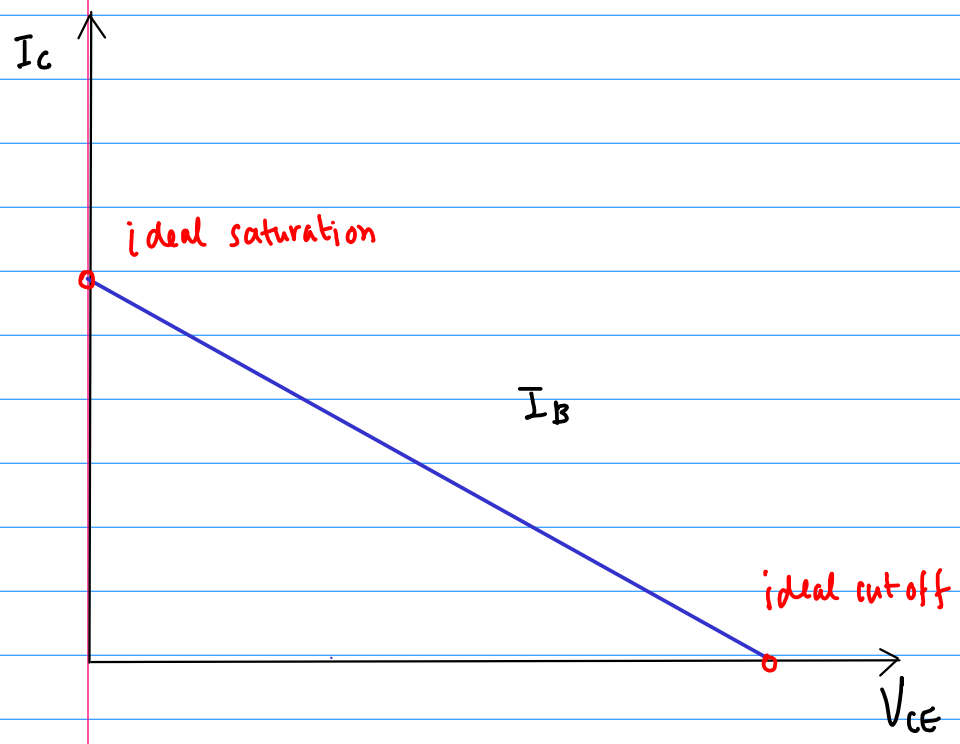

I_C
I_C increase
I_B
V_{CE}
V_{CE} decrease

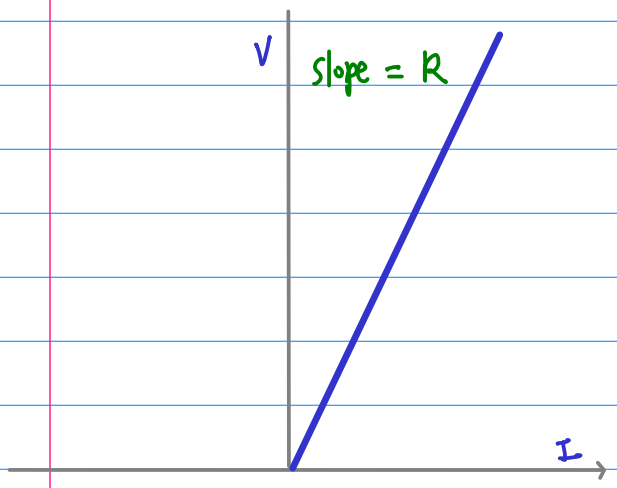

I_C
I_B
V_{CE}


I_C
I_B
V_{CE}

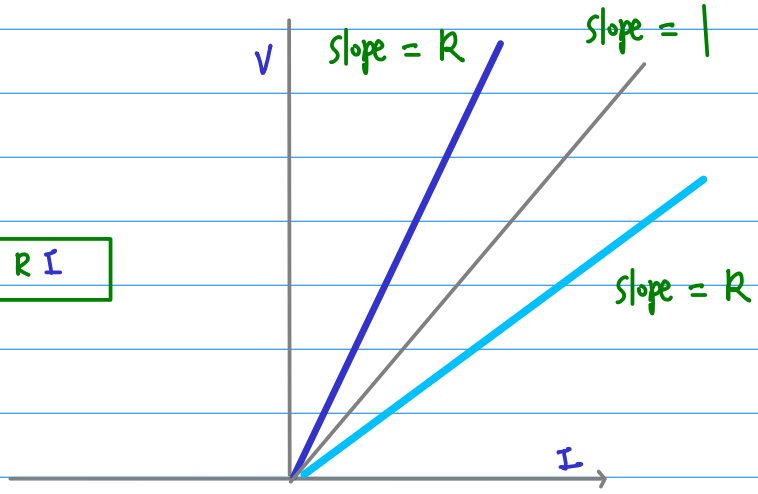

I_C
I_B
V_{CE}

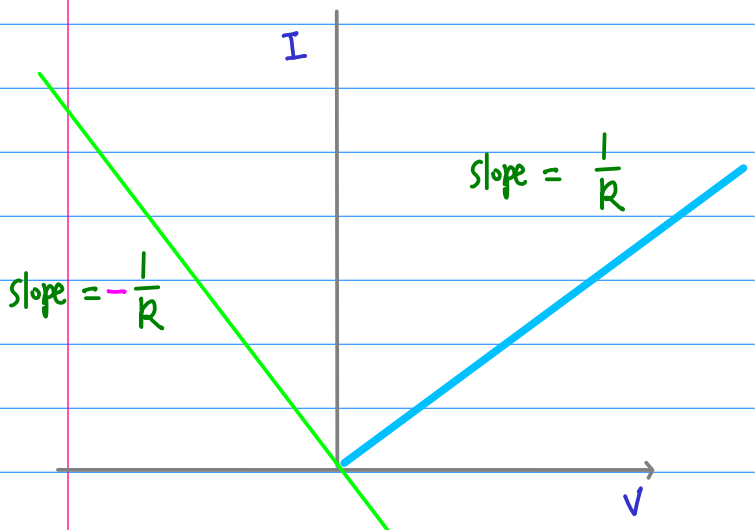

I_C
I_B
V_{CE}


I_C
ideal saturation
I_B
ideal cut off
V_{CE}



$V = RI$

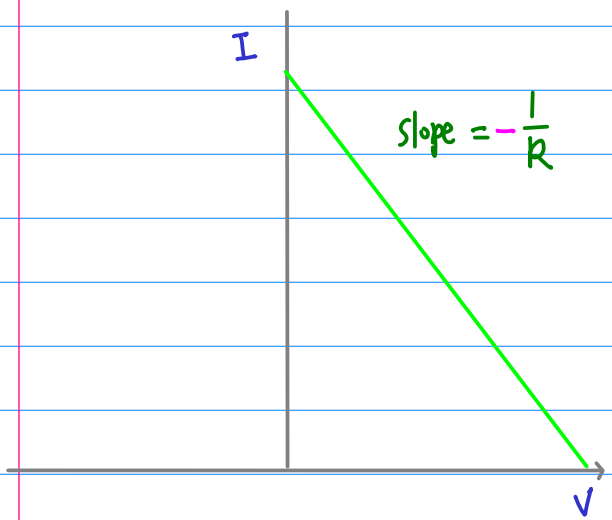




* Change axis $I \leftrightarrow V$

$V = RI \rightarrow I = \frac{1}{R} V$

* reflect along V-axis

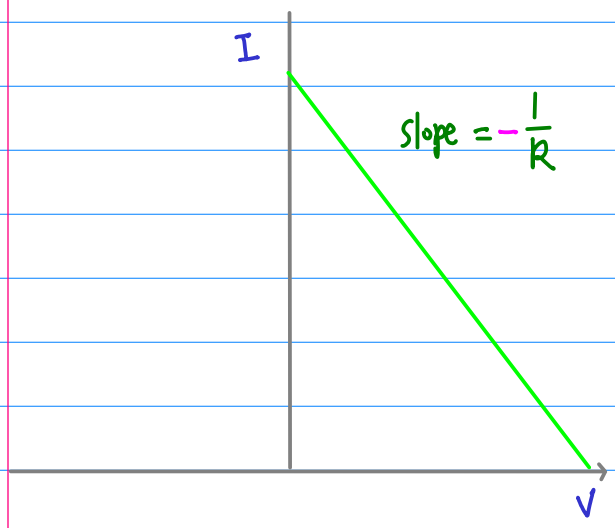


* shift to the right by V_{cc}

$I = -\frac{1}{R}(V - V_{cc})$

$IR = -V + V_{cc}$

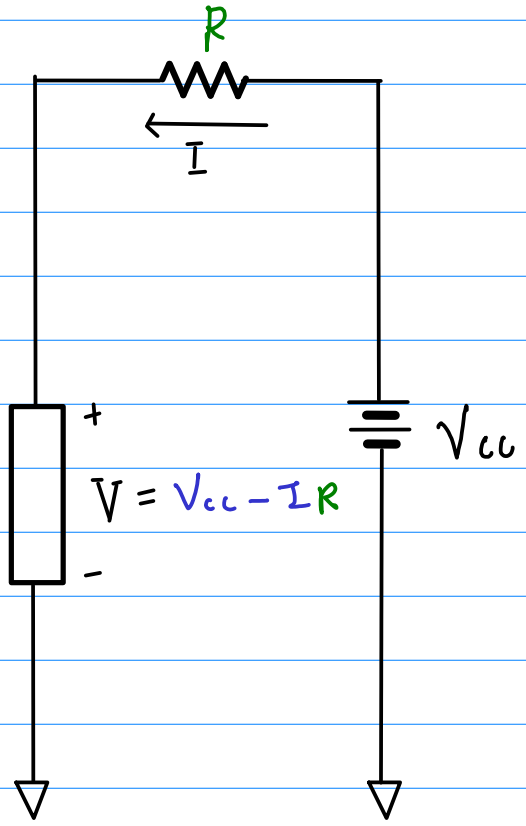
$V = V_{cc} - IR$

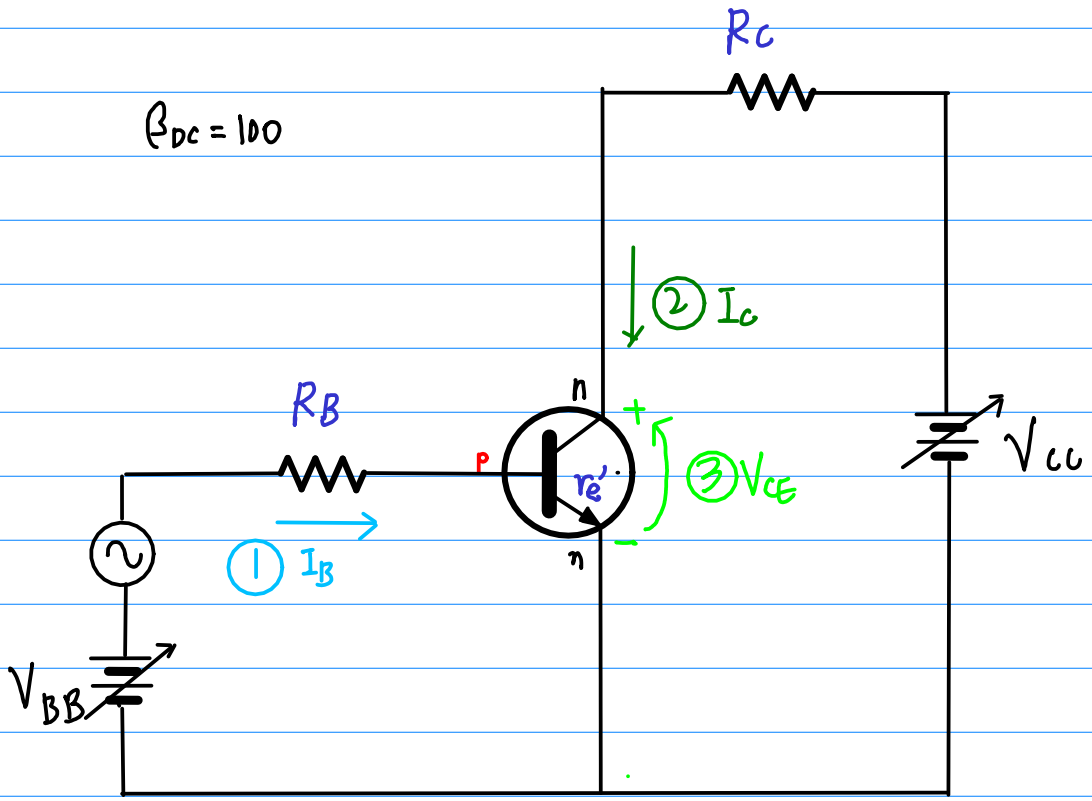


$$I = -\frac{1}{R}(V - V_{cc})$$

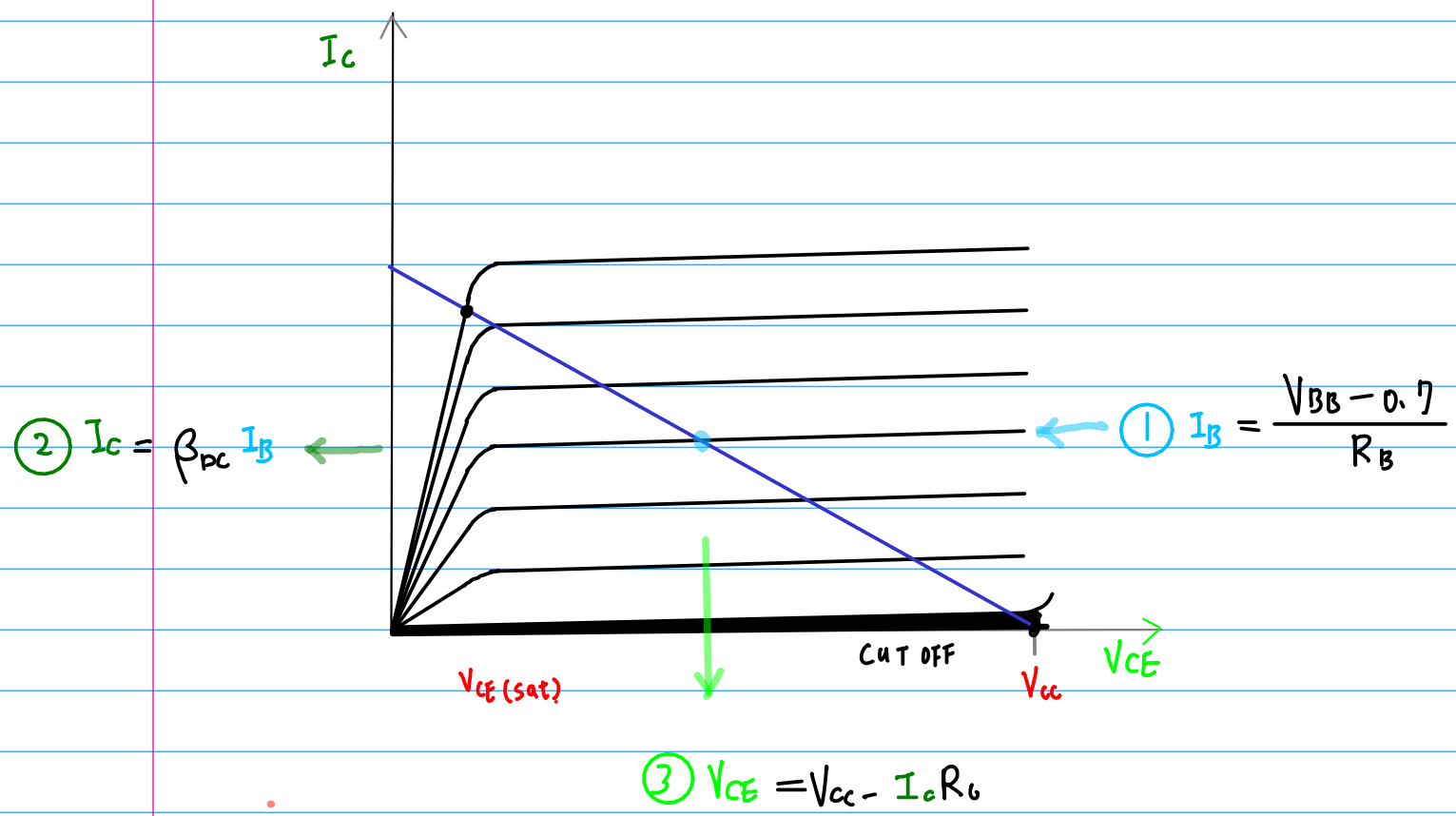
$$IR = -V + V_{cc}$$

$$V = V_{cc} - IR$$





① $I_B = \dfrac{V_{BB} - 0.7}{R_B}$ → ② $I_C = \beta_{DC} I_B$ → ③ $V_{CE} = V_{CC} - I_C R_C$



② $I_C = \beta_{DC} I_B$

① $I_B = \dfrac{V_{BB} - 0.7}{R_B}$

③ $V_{CE} = V_{cc} - I_c R_c$

① $I_B = \dfrac{V_{BB} - 0.7}{R_B}$ → ② $I_C = \beta_{DC} I_B$ → ③ $V_{CE} = V_{cc} - I_c R_c$

③ $V_{CE} = V_{cc} - I_c R_c$

$I_c = \dfrac{1}{R_c} \cdot (V_{CE} - V_{cc})$

y ↓ x ↑