



$$\begin{aligned}
 V_{BB} &= I_E R_E + V_{EB} + I_B R_B \\
 &= I_E R_E + V_{EB} + \frac{I_E}{\beta + 1} R_B
 \end{aligned}$$

$$I_E = \frac{V_{BB} - V_{EB}}{\frac{R_B}{\beta + 1} + R_E} \approx I_C$$

$$V_C = -V_{CC} + I_C R_C$$

$$V_E = -I_E R_E$$

$$\begin{aligned}
 V_B &= V_E - V_{EB} = -I_E R_E - V_{EB} \\
 &= -V_{BB} + I_B R_B
 \end{aligned}$$