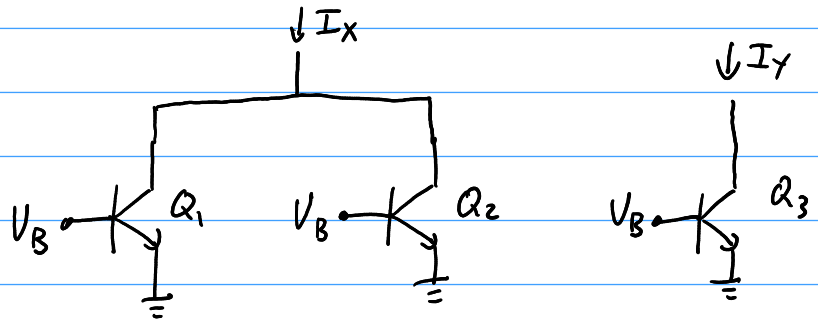


4.5



- (a) Q_1 and Q_2 have the same $I_{S1} = I_{S2} = 3 \times 10^{-16}$ A.
 $\therefore I_x$ will split equally between transistors.

$$\frac{I_x}{2} = I_{S1} e^{V_B/V_T}$$

Assume $T = 300$ K $\Rightarrow V_T = 26$ mV.

$$\frac{0.001}{2} = 3 \times 10^{-16} e^{V_B/0.026}$$

$$V_B = 0.7317 \text{ V.}$$

- (b) $I_y = I_{S3} e^{V_B/V_T}$
 $0.0025 = I_{S3} e^{0.7317/0.026}$
 $I_{S3} = 1.5 \times 10^{-15}$ A.