Hough Transform

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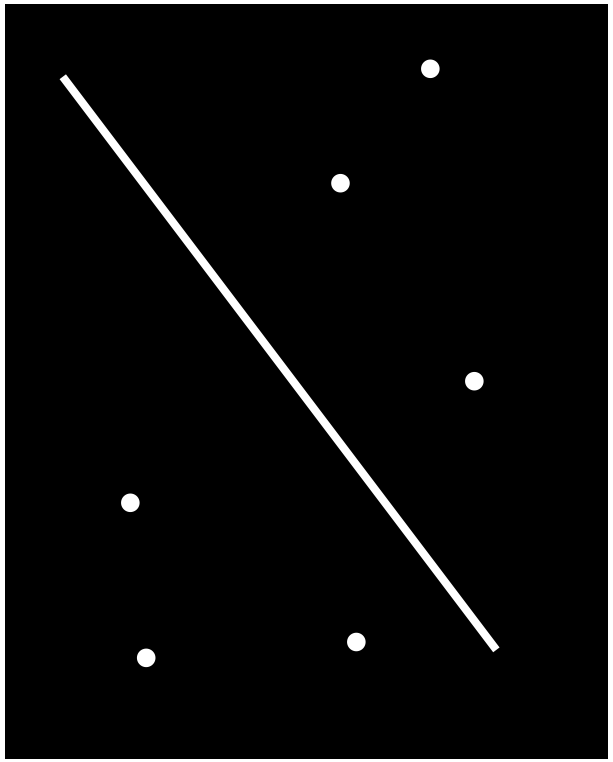
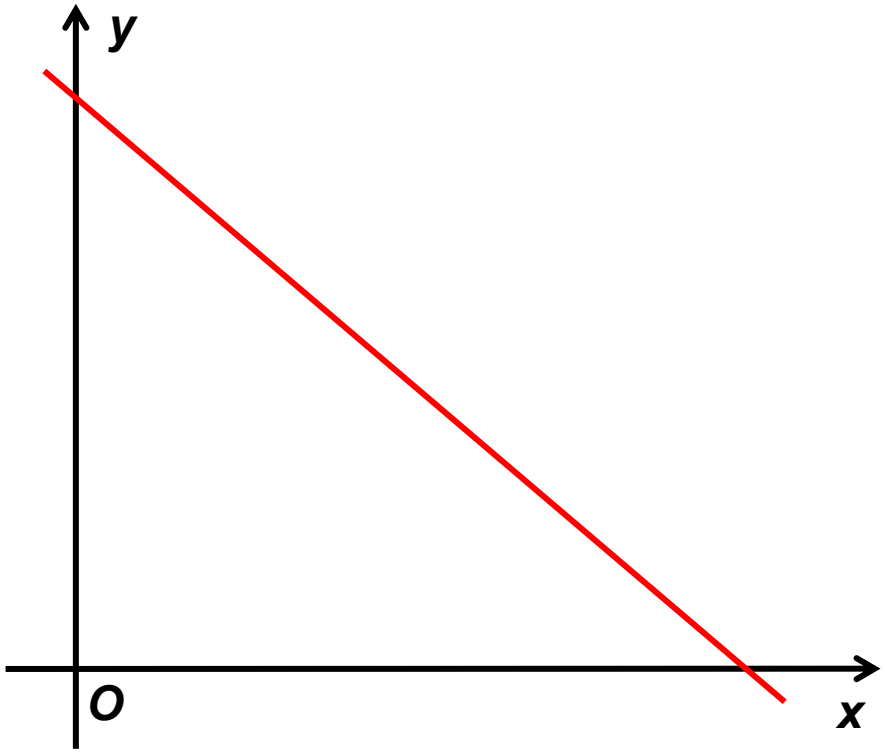
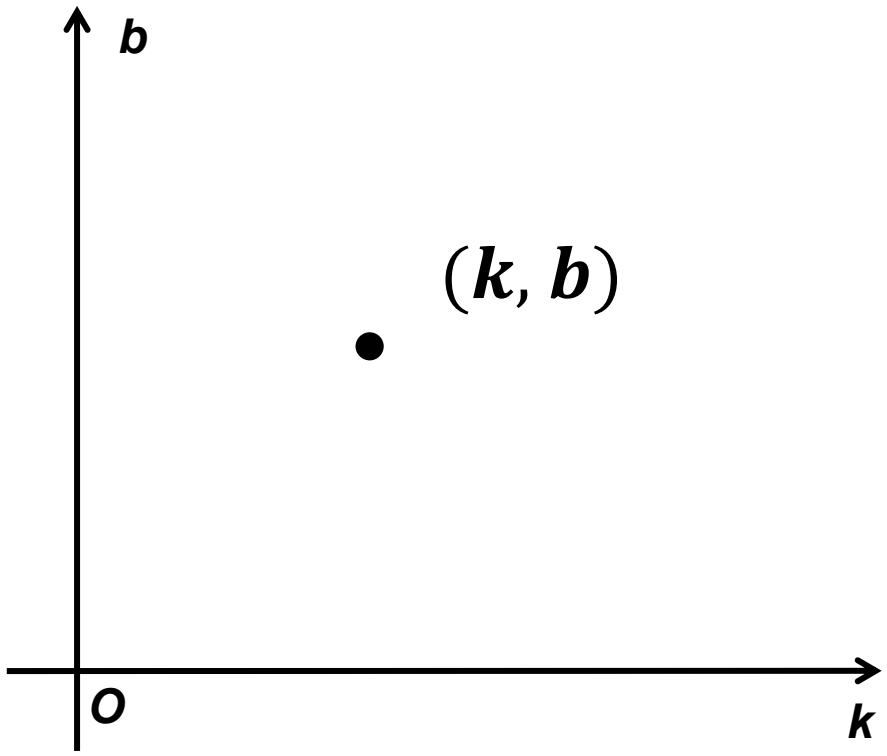
Question



Input

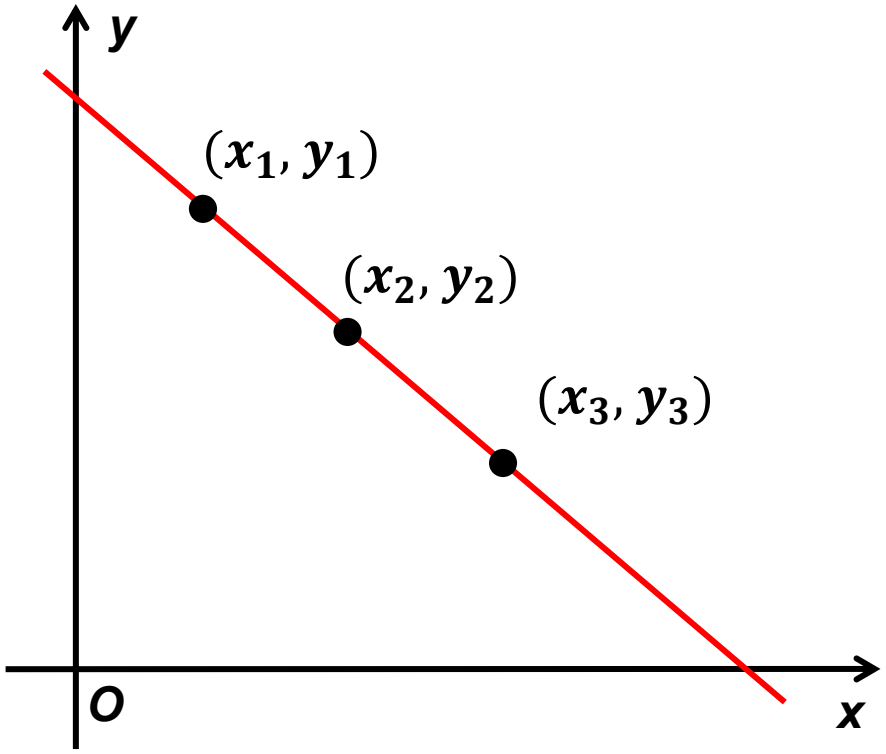
Task：locate the line

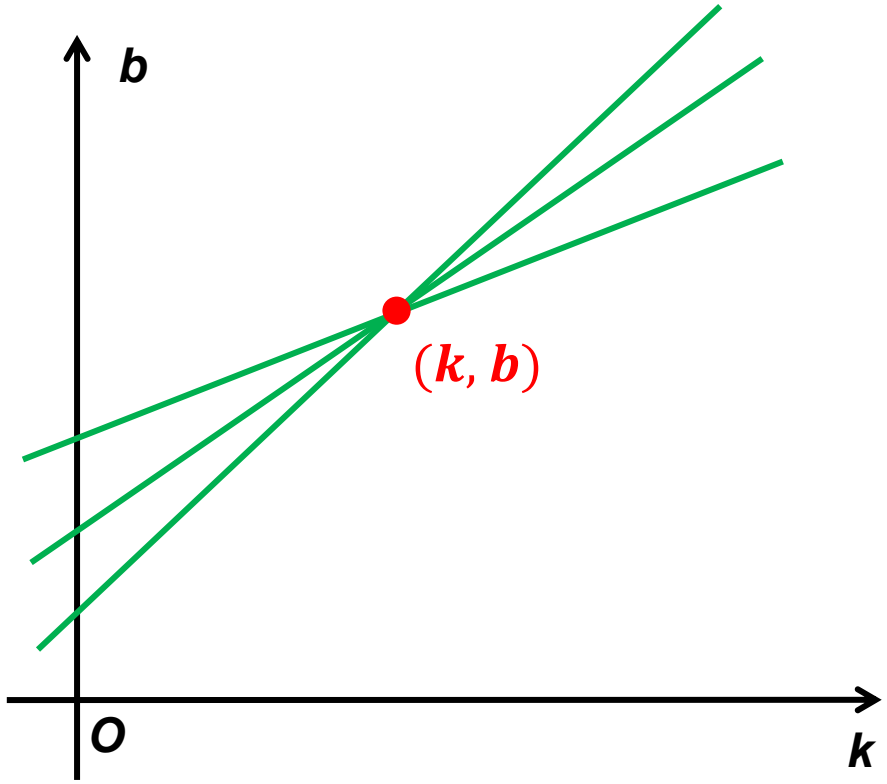




$y = kx + b$

$b = xk + y$





$$y_1 = kx_1 + b$$

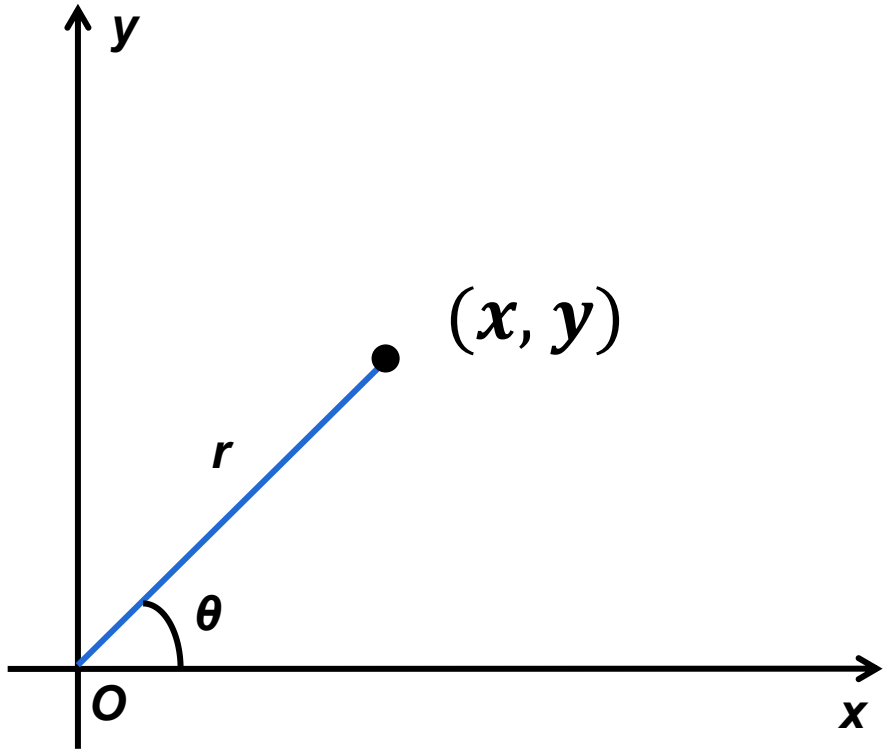
$$y_2 = kx_2 + b$$

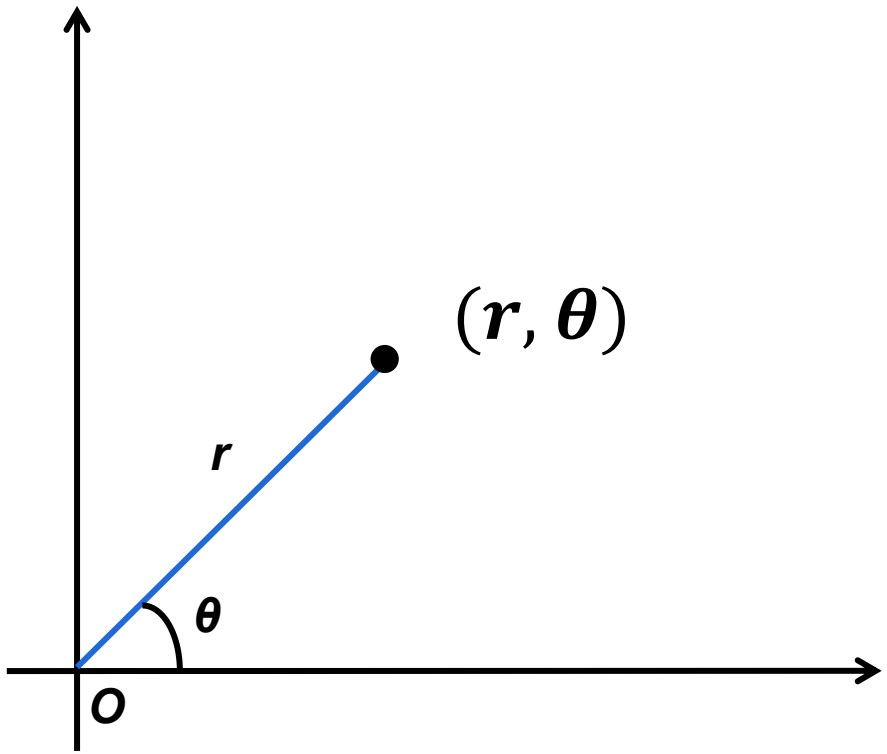
$$y_3 = kx_3 + b$$

$$b_1 = x_1k_1 + y_1$$

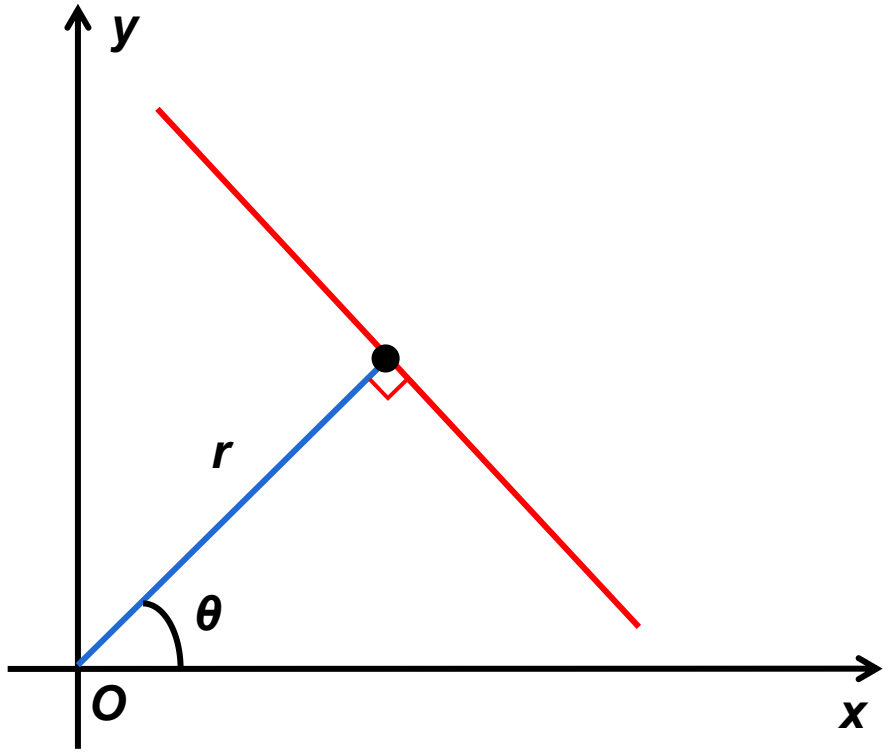
$$b_2 = x_2k_2 + y_2$$

$$b_3 = x_3k_3 + y_3$$



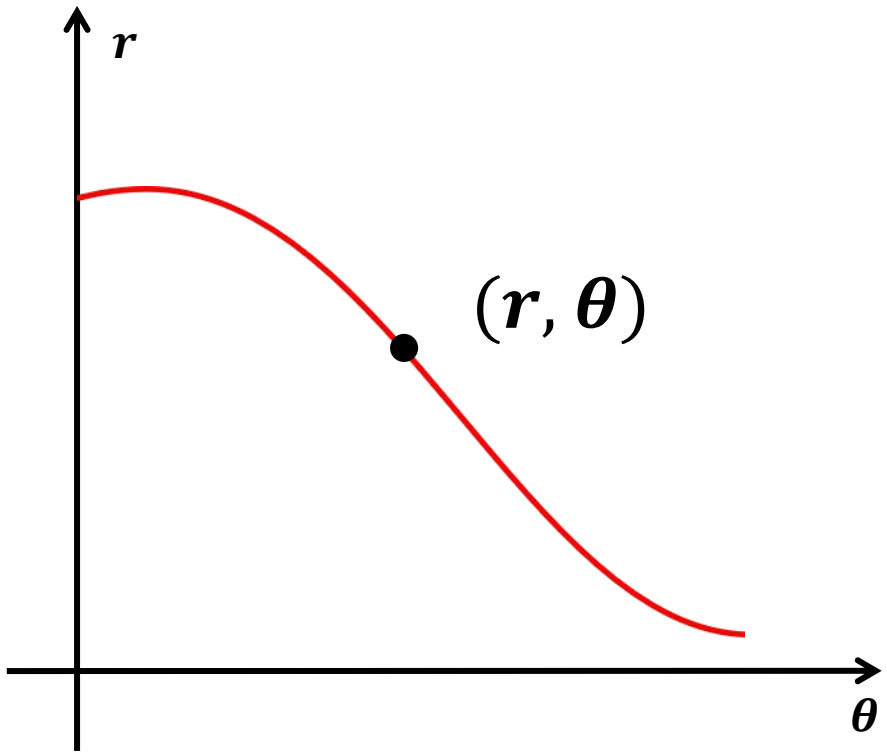


$$\begin{cases} x = r \cdot cos\theta \\ y = r \cdot sin\theta \end{cases} \rightarrow \begin{cases} x \cdot cos\theta = r \cdot cos^2\theta \\ y \cdot sin\theta = r \cdot sin^2\theta \end{cases} \rightarrow \boxed{x \cdot cos\theta + y \cdot sin\theta = r}$$

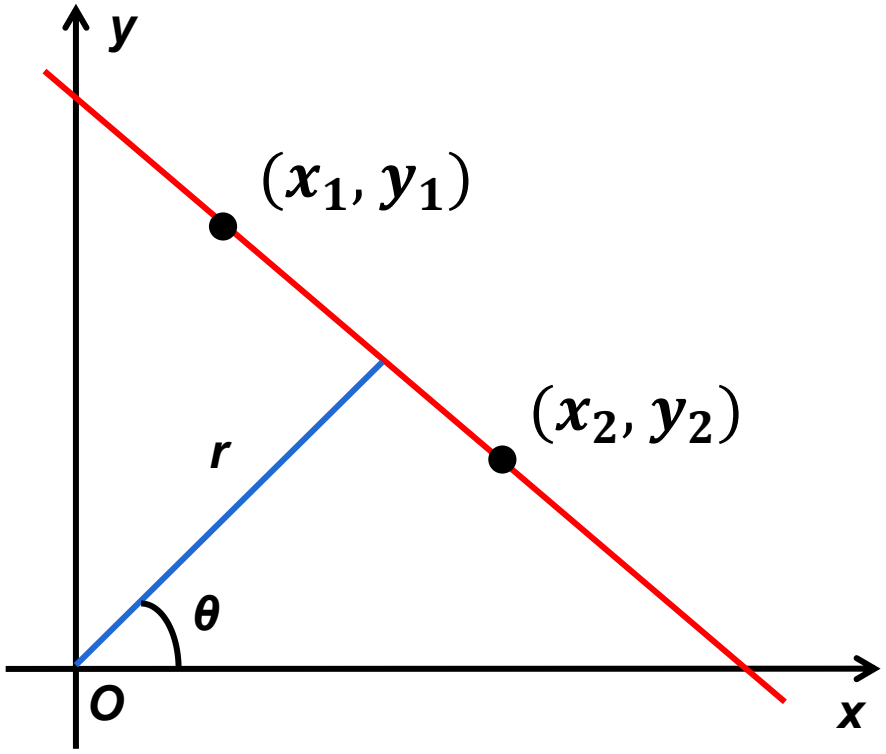


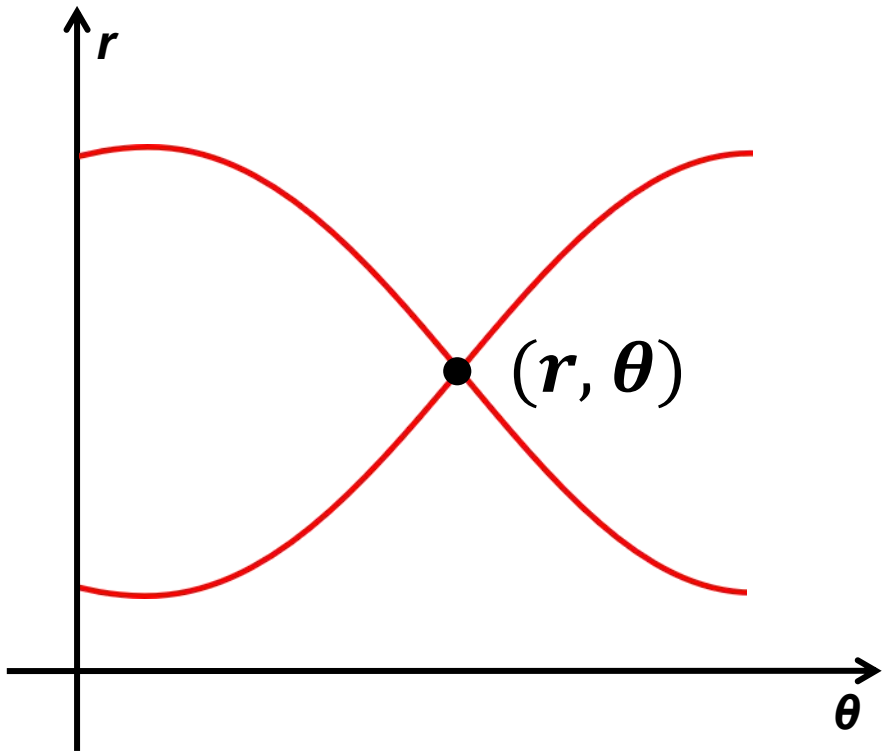
$$x \cdot cos\theta + y \cdot sin\theta = r$$

$$\begin{cases} y = -\dfrac{cos\theta}{sin\theta}x + \dfrac{r}{sin\theta}, \theta \neq 0 \\ x = r, \theta = 0 \end{cases}$$



$$x \cdot cos\theta + y \cdot sin\theta = r$$





$$x_1 \cdot cos\theta + y_1 \cdot sin\theta = r$$

$$x_2 \cdot cos\theta + y_2 \cdot sin\theta = r$$

$$x_3 \cdot cos\theta + y_3 \cdot sin\theta = r$$

$$r = x_1 \cdot cos\theta + y_1 \cdot sin\theta$$

$$r = x_2 \cdot cos\theta + y_2 \cdot sin\theta$$

$$r = x_3 \cdot cos\theta + y_3 \cdot sin\theta$$

Demo

Requirements：

matplotlib、numpy、PIL、skimage