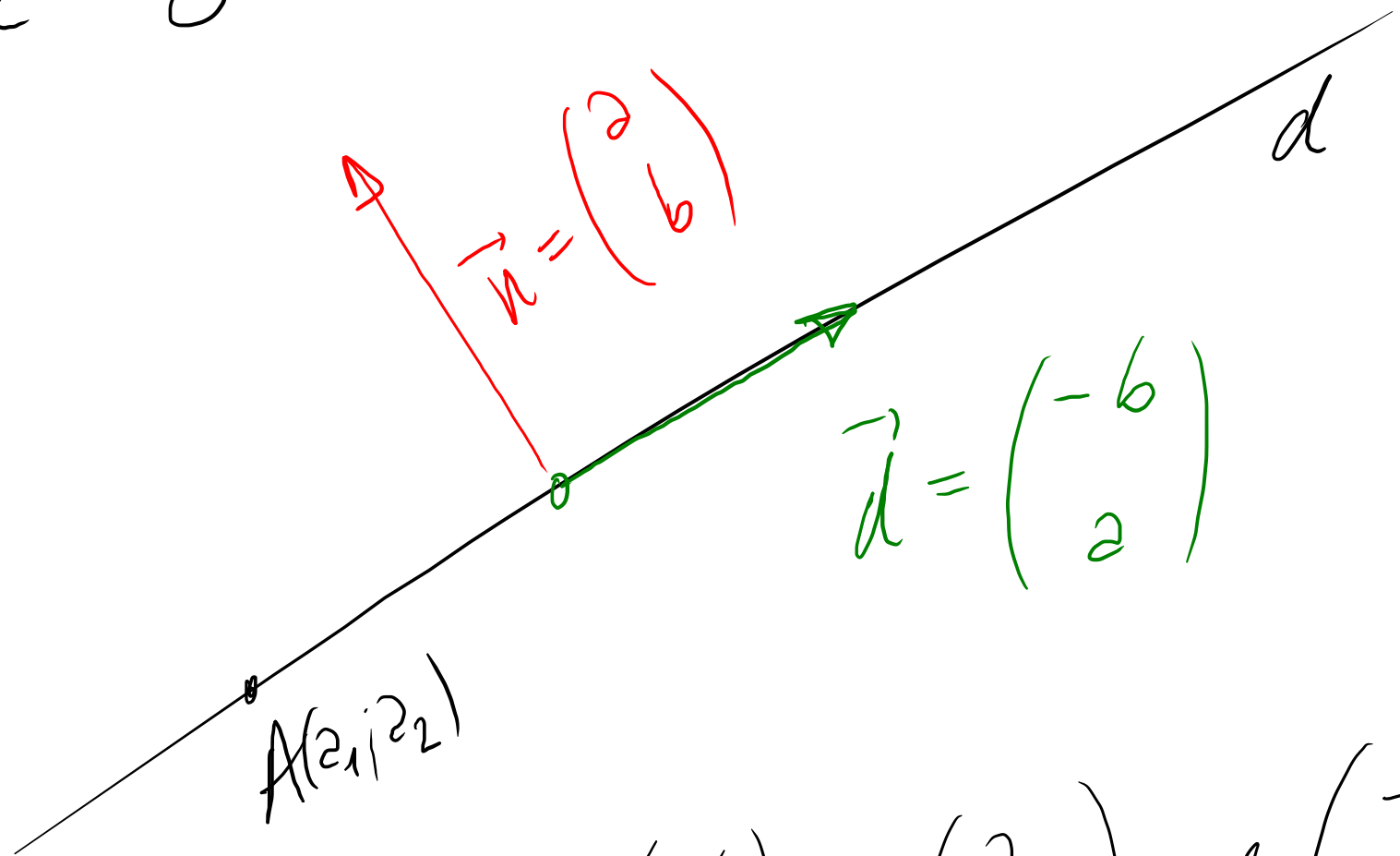


$$d: ax + by + c = 0$$



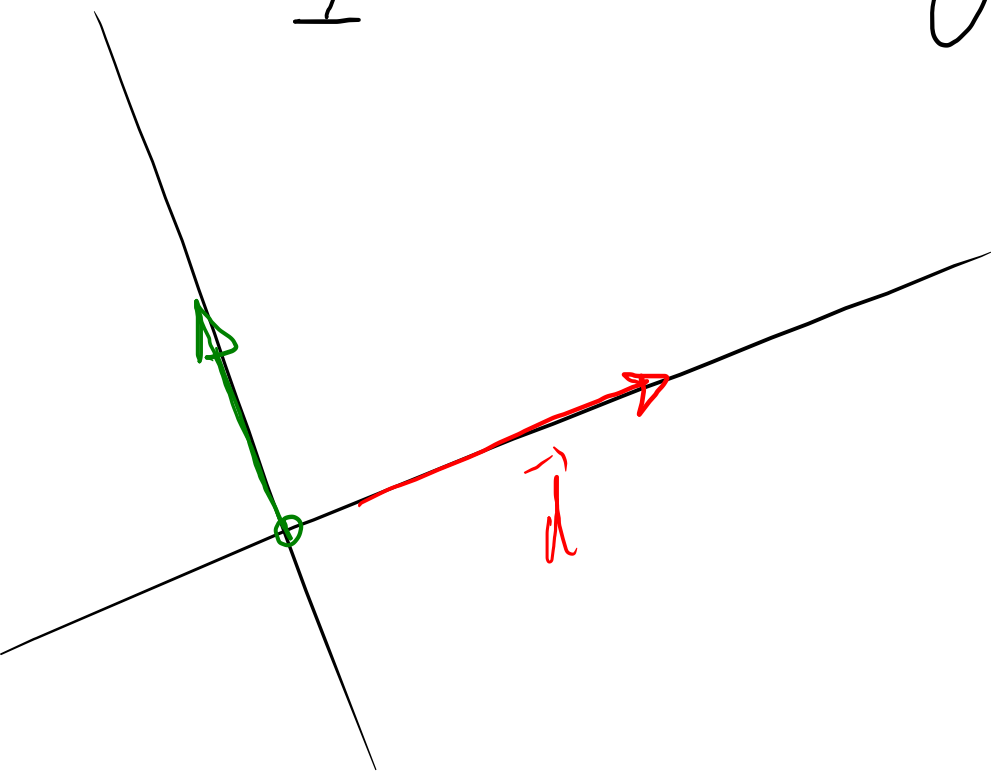
$$\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} a_1 \\ a_2 \end{pmatrix} + k \begin{pmatrix} -b \\ a \end{pmatrix}$$

$$d: 3x - 4y + 5 = 0$$

$$\vec{d} = \begin{pmatrix} 4 \\ 3 \end{pmatrix}$$

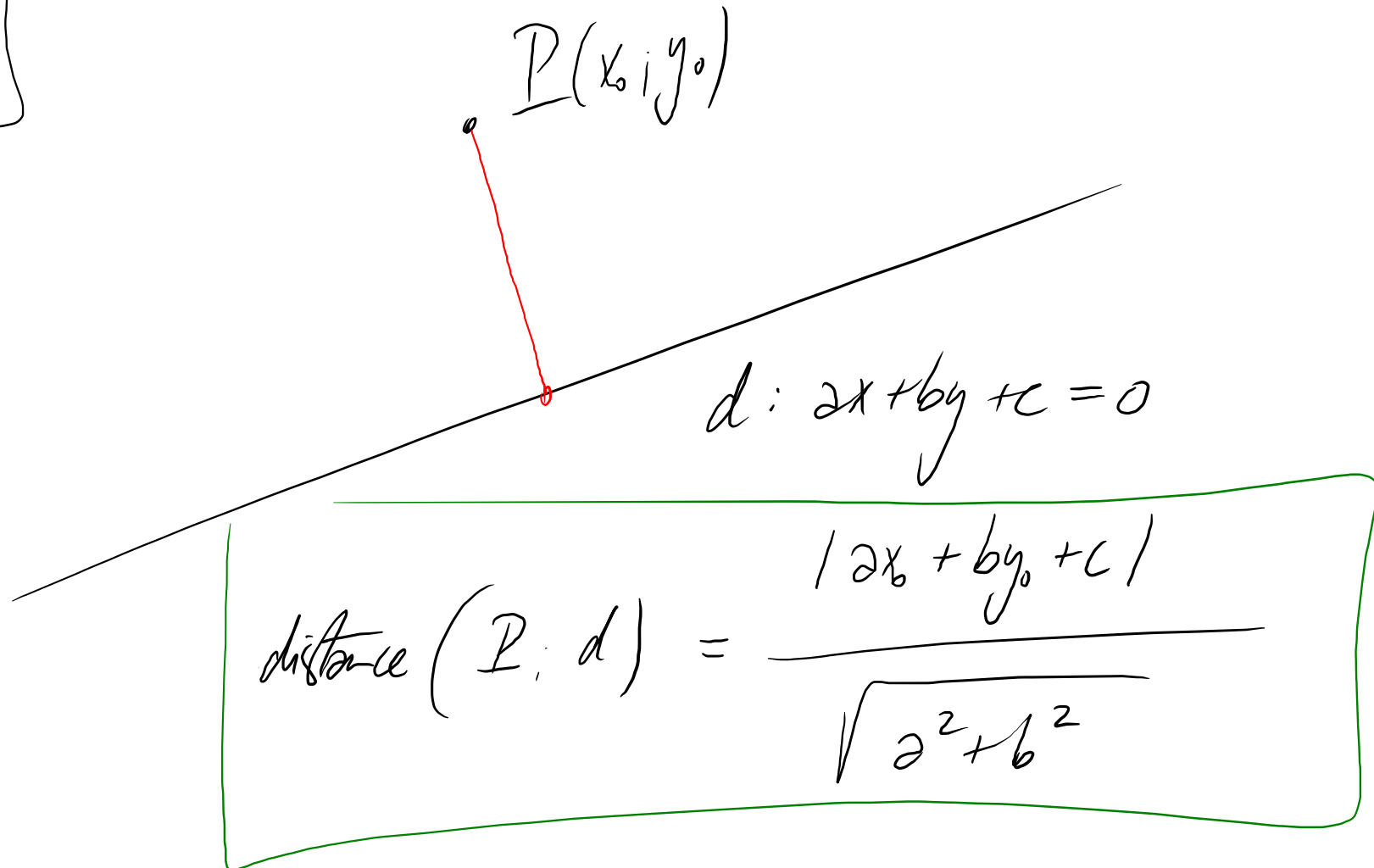
$$d_{\perp}: 4x + 3y + k = 0$$

$$k \in \mathbb{R}$$



$$d_{\parallel}: 3x - 4y + k = 0$$

Distance

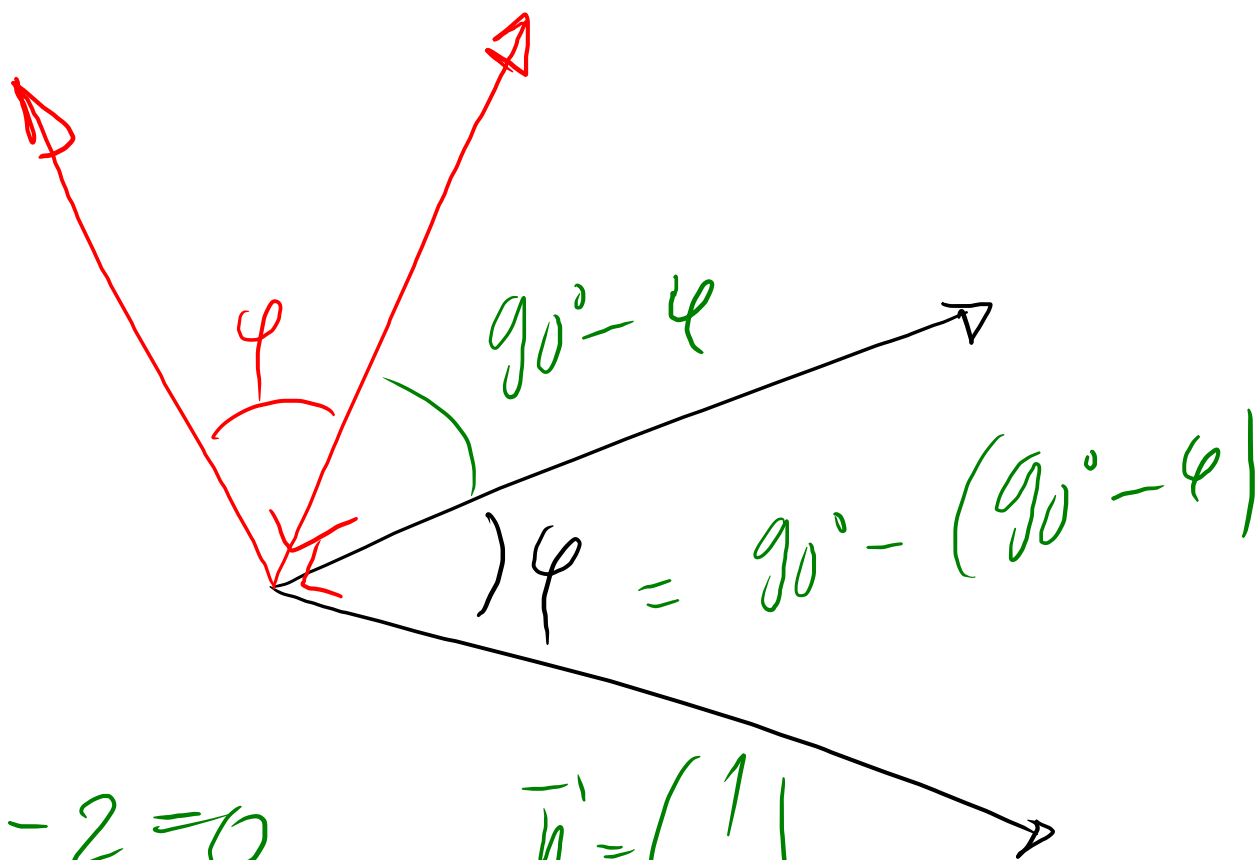


Example:

$$3x - 4y + 5 = 0$$

$$P(10, 15)$$

$$\begin{aligned} \text{dist}(P; d) &= \frac{|3 \cdot 10 - 4 \cdot 15 + 5|}{\sqrt{3^2 + (-4)^2}} \\ &= \frac{|-25|}{5} = 5 \end{aligned}$$



$$x + y - 2 = 0$$

$$\vec{n}_1 = \begin{pmatrix} 1 \\ 1 \end{pmatrix}$$

$$3x - 4y + 5 = 0$$

$$\vec{n}_2 = \begin{pmatrix} 3 \\ -4 \end{pmatrix}$$

$$2x + by + c = 0$$

$$x = 8$$

$$\boxed{x + 0y - 8 = 0}$$

$$\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 8 \\ 12 \end{pmatrix} + k \begin{pmatrix} 0 \\ 1 \end{pmatrix}$$

$$y = 12 + k$$

$$\begin{pmatrix} 1 \\ 0 \end{pmatrix} \begin{matrix} a \\ b \end{matrix}$$

$$2x + by + c = 0$$

$$x + 0y + c = 0$$

$$x + c = 0 / 8 + c = 0 / c = -8$$

$$\begin{pmatrix} 2 \\ 3 \end{pmatrix} \perp \begin{pmatrix} 3 \\ -2 \end{pmatrix}$$

$$\vec{n} = \begin{pmatrix} a \\ b \end{pmatrix}$$

$$d: \boxed{2x + by + c = 0}$$

$$\boxed{\vec{n} \perp d}$$

$$\begin{pmatrix} 2 \\ 3 \end{pmatrix} \perp \begin{pmatrix} -3 \\ 2 \end{pmatrix}$$

$$\vec{d} = \begin{pmatrix} -4 \\ 1 \end{pmatrix}$$

$$\vec{n} = \begin{pmatrix} 1 \\ 4 \end{pmatrix}$$

per $A(3; 5)$
 $x_0 \quad y_0$

$$\boxed{x + 4y - 23 = 0}$$

$$d: x + 4y + c = 0$$

$$3 + 20 + c = 0$$

$$c = -23$$

$$\begin{matrix} x_0 & y_0 \\ \downarrow & \downarrow \\ 1 \cdot 3 + 4 \cdot 5 + c = 0 \end{matrix}$$

$$3x - 4y + 5 = 0$$

$$x = \frac{4}{3}y - \frac{5}{3}$$

$$y = 1y + 0$$

$$\vec{d} = \begin{pmatrix} 4 \\ 3 \end{pmatrix}$$

$$\vec{n} = \begin{pmatrix} 3 \\ -4 \end{pmatrix}$$

$$\begin{pmatrix} x \\ y \end{pmatrix} = y \cdot \begin{pmatrix} 4/3 \\ 1 \end{pmatrix} - \begin{pmatrix} 5/3 \\ 0 \end{pmatrix}$$

$$= y \cdot \begin{pmatrix} 4 \\ 3 \end{pmatrix} - \begin{pmatrix} 5/3 \\ 0 \end{pmatrix}$$