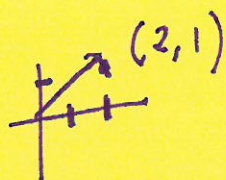


Vector

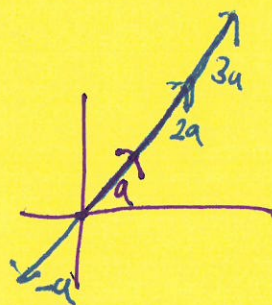


Addition $a + b = \begin{bmatrix} a_x \\ a_y \end{bmatrix} + \begin{bmatrix} b_x \\ b_y \end{bmatrix} = \begin{bmatrix} a_x + b_x \\ a_y + b_y \end{bmatrix}$



Scaling

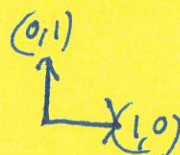
$$\alpha a = \alpha \begin{bmatrix} a_x \\ a_y \end{bmatrix} = \begin{bmatrix} \alpha a_x \\ \alpha a_y \end{bmatrix}$$

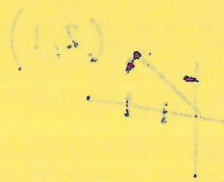


Cartesian coordinates

$$a = \begin{bmatrix} a_x \\ a_y \end{bmatrix} = a_x \begin{bmatrix} 1 \\ 0 \end{bmatrix} + a_y \begin{bmatrix} 0 \\ 1 \end{bmatrix}$$

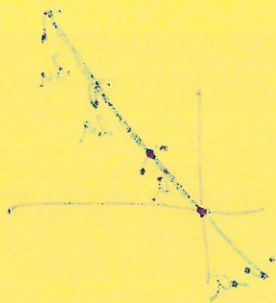
$\nwarrow e_1$
 $\nwarrow e_2$





vector

$$\begin{bmatrix} x_1 + x_2 \\ y_1 + y_2 \end{bmatrix} = \begin{bmatrix} x_1 \\ y_1 \end{bmatrix} + \begin{bmatrix} x_2 \\ y_2 \end{bmatrix} = b + a \quad \text{Addition}$$



$$\begin{bmatrix} x_1 \\ y_1 \end{bmatrix} = \begin{bmatrix} x_2 \\ y_2 \end{bmatrix} \quad \text{Scaling}$$

Cartesian coordinates



$$a = \begin{bmatrix} x_1 \\ y_1 \end{bmatrix} = \begin{bmatrix} 1 \\ 0 \end{bmatrix} + \begin{bmatrix} 0 \\ 1 \end{bmatrix} x_2 = \begin{bmatrix} x_2 \\ y_2 \end{bmatrix} = b$$

Lines

→ Std form $Ax + By + C = 0$

~~Slope int~~ $y = mx + b$

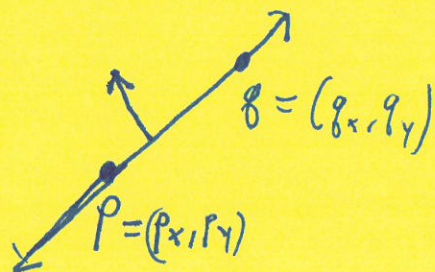
Given 2 points P, Q What is line through P, Q

form \perp vector to \overrightarrow{PQ}

$$\begin{pmatrix} P_y - Q_y \\ Q_x - P_x \end{pmatrix}$$

$$f(x, y) = Ax + By + C$$

$$\nabla f(x, y) = [A, B]$$



$$(P_y - Q_y)x + (Q_x - P_x)y + C = 0$$

plug in P and solve for C

$$C = P_x Q_y - Q_x P_y$$

lines

$$0 = C + r\delta + xA \quad \text{not to be}$$

$$\delta + xm = r$$

8, 9 through 10 what is the value of 8, 9

form 1 needs to be



$$\begin{aligned} & \begin{bmatrix} x\delta - r \\ r\delta - x \end{bmatrix} \\ & C + r\delta + xA = (rx)\delta \\ & [\delta, A] = (rx)\delta \end{aligned}$$

$$0 = C + r(x\delta - r) + x(r\delta - r)$$

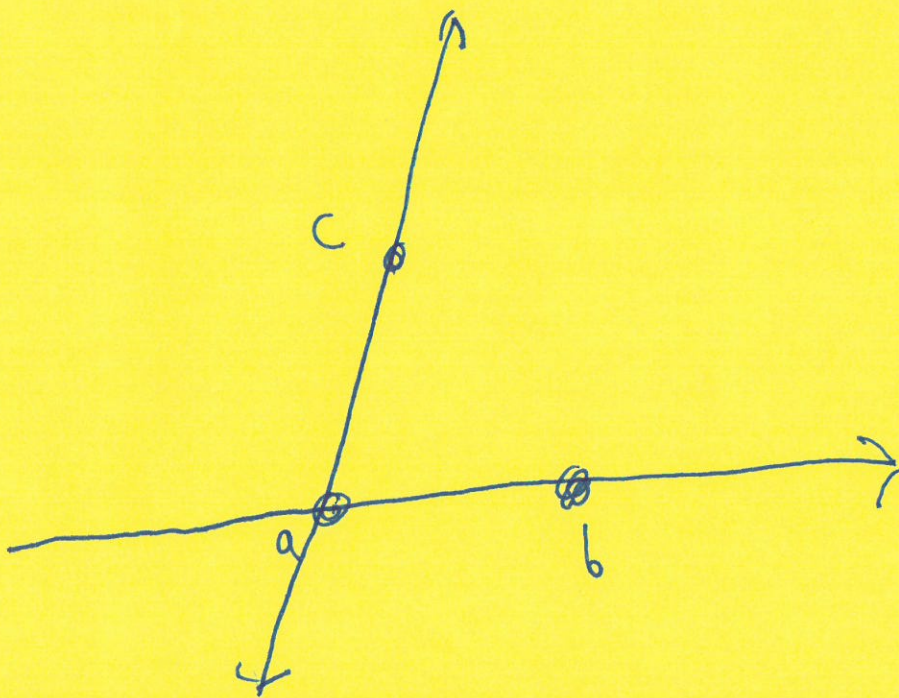
giving us 8 and 9

$$r\delta - r = 0$$

Line through p & q has formula

$$(p_y - q_y)x + (q_x - p_x)y + p_x q_y - q_x p_y = 0$$

$$\begin{vmatrix} p_x & p_y & 1 \\ q_x & q_y & 1 \\ x & y & 1 \end{vmatrix} = 0 = f_{pq}(x, y)$$



Stimmt mit 2.9 überein

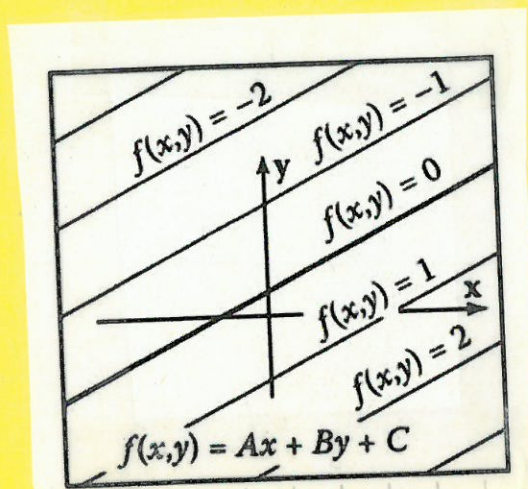
$$0 = \boxed{1 \times 8 - 7 \times 9 + 7(9 - 8) + 8(7 - 9)}$$

$$(x, y)_{\frac{1}{2}} = 0 = \begin{vmatrix} 1 & 9 & x \\ 1 & 8 & y \\ 1 & 7 & x \end{vmatrix}$$



Barycentric coordinates

$$f(x, y) = Ax + By + C$$



$$p = a + \beta(b-a) + \gamma(c-a) \quad (\Rightarrow)$$

$$p = (1 - \beta - \gamma)a + \beta b + \gamma c$$

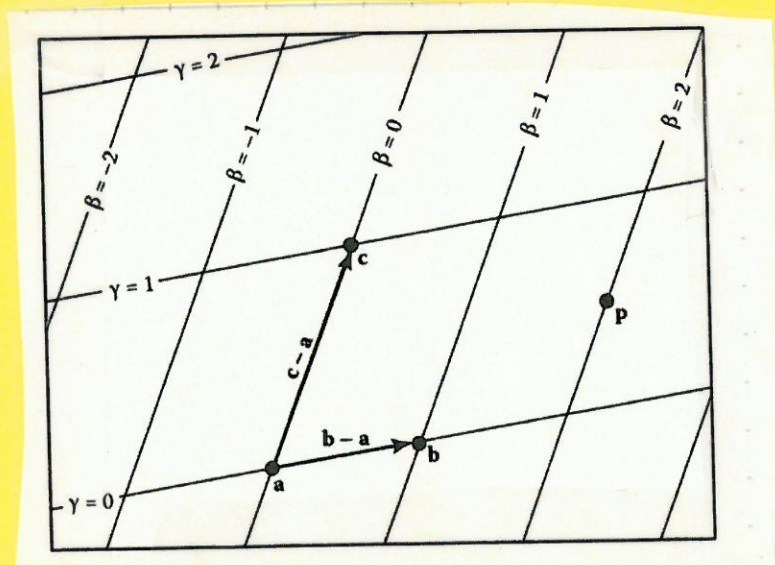
$$\text{def } \alpha = 1 - \beta - \gamma$$

$$p = \alpha a + \beta b + \gamma c$$

Barycentric coordinate of P

w/ Δabc

is (α, β, γ)



particular coordinates

$$x + y + z = (x, y, z)$$

$$\Rightarrow (a-1)x + (a-1)y + z = a$$

$$x + y + z + (1-a)x + (1-a)y = a$$

$$x - y - 1 = a \quad \text{let}$$

$$x + y + z + a = a$$

particular coordinates of

the line

$$(x, y, z)$$