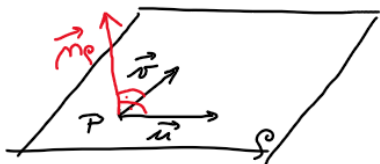


Obecná rovnice roviny v prostoru.



$$\vec{u} = (u_1, u_2, u_3)$$

$$\vec{v} = (v_1, v_2, v_3)$$

$$P [x_1, x_2, x_3]$$

PV roviny

$$x = x_1 + t u_1 + s v_1$$

$$y = x_2 + t u_2 + s v_2$$

$$z = x_3 + t u_3 + s v_3$$

$$t, s \in \mathbb{R}$$

⇒ vyložíme oba parametry t, s

$$ax + by + cz + d = 0 \text{ OR roviny}$$

normálový vektor roviny $\vec{n}_p = (a, b, c)$ $\vec{n}_p \perp \vec{u} \wedge \vec{n}_p \perp \vec{v}$

formula vektorového součinu určuje \vec{n}_p jako $\vec{n}_p = \vec{u} \times \vec{v}$

Př. 1. Napište OR roviny dané bodem A [1, 0, 1] a vektory $\vec{u} = (-2, 3, 1)$, $\vec{v} = (1, 2, -1)$

$$ax + by + cz + d = 0 \Rightarrow \underbrace{a, b, c, d}_{\vec{n}} = z$$

$$\vec{u} = (-2, 3, 1)$$

$$\vec{v} = (1, 2, -1)$$

$$\text{OR } \rho: 5x + y + 7z + d = 0$$

$$A: 5 + 0 + 7 + d = 0 \quad d = -12$$

$$\rho: \underline{5x + y + 7z - 12 = 0}$$

$$\vec{n}_p = \vec{u} \times \vec{v} = (-5, -1, -4) \Rightarrow (5, 1, 4)$$

Př. 2. OR roviny ABC: A [1, 1, 4], B [-1, 2, 1], C [0, -1, 0]

$$\vec{u} = \vec{AB} = (-2, 1, -3)$$

$$\vec{v} = \vec{AC} = (-1, -2, -4)$$

$$\rho: 2x + y - z + d = 0$$

$$C: 0 - 1 - 0 + d = 0 \quad d = 1$$

$$\vec{n}_p = \vec{u} \times \vec{v} = (-10, -5, 5) \Rightarrow (2, 1, -1)$$

$$\rho: \underline{2x + y - z + 1 = 0}$$

Př. 3. Zjistěte, zda bod M [1, 1, -1] leží v rovině $\rho: 3x - 2y + z = 0$

$$M: 3 \cdot 1 - 2 \cdot 1 - 1 = 0 \Rightarrow 0 = 0 \Rightarrow \underline{M \in \rho}$$

Př. 4. Napište OR roviny dané PV: $x = 1 + 2t - 2s$

$$\vec{u} = (2, -1, 2)$$

$$\vec{v} = (-2, -1, 1)$$

$$y = 2 - t - s$$

$$z = -1 + 2t + s$$

$$A [1, 2, -1]$$

$$\vec{u} = (2, -1, 2)$$

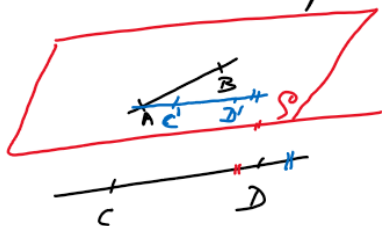
$$\vec{v} = (-2, -1, 1)$$

$$\rho: x - 6y - 4z + d = 0$$

$$A: 1 - 12 + 4 + d = 0 \quad d = 7$$

$$\rho: \underline{x - 6y - 4z + 7 = 0}$$

Př. 5. Napište OR roviny, která prochází body A [2, 4, 7], B [1, 6, 0] a je rovnoběžná s přímkou CD, C [3, 1, 5], D [-1, 0, 4]



$$\vec{u} = \vec{AB} = (-1, 2, -7)$$

$$\vec{v} = \vec{CD} = (-4, -1, -1)$$

$$\rho: x - 3y - z + d = 0$$

$$A: 2 - 12 - 7 + d = 0 \quad d = 17$$

$$\rho: \underline{x - 3y - z + 17 = 0}$$

$$\vec{u} \times \vec{v} = \vec{n} = (-9, 27, 9) = (1, -3, -1)$$

body C, D neleže dovnitř!