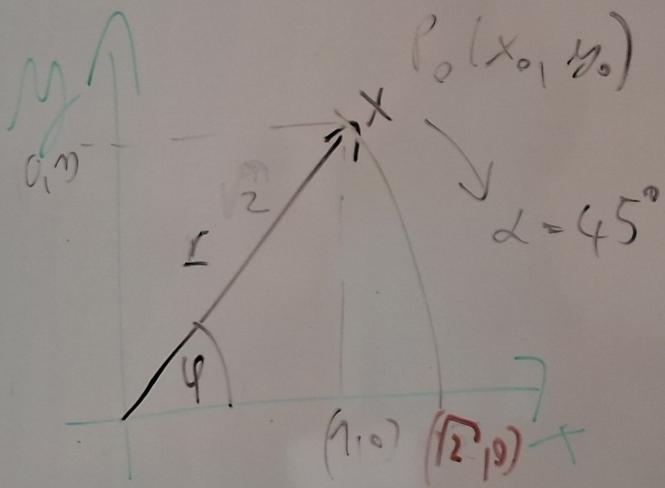


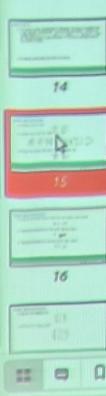
Rotation no



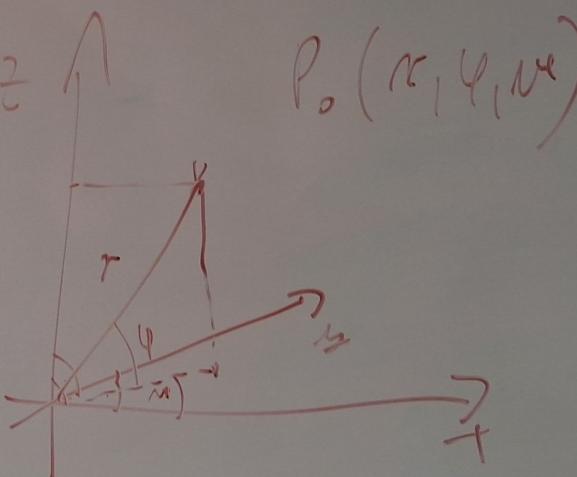
$$P_1(\gamma_1 \gamma)$$

$$\alpha = 45^\circ$$

$$\left(\frac{\sqrt{2}}{2} - \frac{\sqrt{2}}{2} \right)$$

$$\begin{pmatrix} \cos \\ \sin \end{pmatrix}$$
 $P_1(x_1, y_1)$ $\alpha = 45^\circ$

$$\begin{pmatrix} \frac{\sqrt{2}}{2} & -\frac{\sqrt{2}}{2} \\ \frac{\sqrt{2}}{2} & \frac{\sqrt{2}}{2} \end{pmatrix} \begin{pmatrix} 1 \\ 1 \end{pmatrix} = \begin{pmatrix} 0 \\ \sqrt{2} \end{pmatrix}$$

Rotation in \mathbb{R}^2  $P_0(x_0, y_0)$

$$\begin{aligned} r &= \sqrt{x_1^2 + y_1^2} \\ \beta &= 45^\circ \\ \begin{pmatrix} x_1 \\ y_1 \end{pmatrix} &= \begin{pmatrix} 1 \\ 1 \end{pmatrix} \\ \begin{pmatrix} x_0 \\ y_0 \end{pmatrix} &= \begin{pmatrix} \frac{\sqrt{2}}{2} & 0 \\ 0 & \frac{\sqrt{2}}{2} \end{pmatrix} \begin{pmatrix} 1 \\ 1 \end{pmatrix} \\ &= \begin{pmatrix} \frac{\sqrt{2}}{2} & \frac{\sqrt{2}}{2} \\ \frac{\sqrt{2}}{2} & \frac{\sqrt{2}}{2} \end{pmatrix} \begin{pmatrix} 1 \\ 1 \end{pmatrix} \end{aligned}$$

$$r = 1 \rightarrow (1, 0, 0)$$

$$\vartheta = 45^\circ$$

$$\psi = 45^\circ$$

$$R \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix} = \begin{pmatrix} \frac{\sqrt{2}}{2} \\ \frac{1}{2} \\ \frac{1}{2} \end{pmatrix} = \frac{1}{2} \begin{pmatrix} \sqrt{2} \\ 1 \\ 1 \end{pmatrix}$$

$$(x_1, y_1, z_1) = ?$$

$$= \begin{pmatrix} 1 & 0 & 0 \\ 0 & \frac{\sqrt{2}}{2} & -\frac{\sqrt{2}}{2} \\ 0 & \frac{\sqrt{2}}{2} & \frac{\sqrt{2}}{2} \end{pmatrix} \begin{pmatrix} \frac{\sqrt{2}}{2} & 0 \\ \frac{1}{2} & 0 \\ \frac{1}{2} & 0 \end{pmatrix} =$$

$$= \begin{pmatrix} 1 & 0 & 0 \\ 0 & \frac{\sqrt{2}}{2} & -\frac{\sqrt{2}}{2} \\ 0 & \frac{\sqrt{2}}{2} & \frac{\sqrt{2}}{2} \end{pmatrix} \begin{pmatrix} 0 & 1 & 1 \\ -\frac{\sqrt{2}}{2} & 0 & 1 \\ -\frac{\sqrt{2}}{2} & 1 & 0 \end{pmatrix} = \frac{1}{2} \begin{pmatrix} \sqrt{2} & -\sqrt{2} & 0 \\ 1 & 1 & -\sqrt{2} \\ -1 & 1 & \sqrt{2} \end{pmatrix}$$

Rotation 2D

R_y

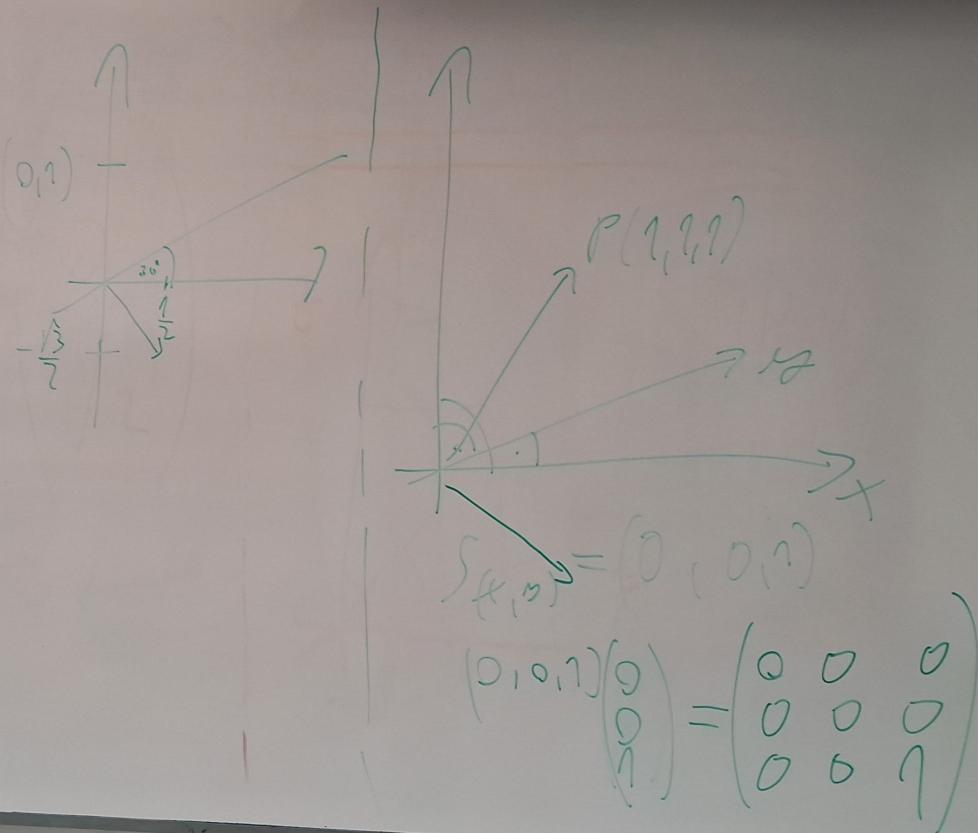
R_x

(0)



$$R = \begin{pmatrix} \frac{\sqrt{3}}{2} & \frac{1}{2} \\ \frac{1}{2} & \frac{\sqrt{3}}{2} \end{pmatrix} \cdot \begin{pmatrix} \frac{1}{2} & -\frac{\sqrt{3}}{2} \\ \frac{\sqrt{3}}{2} & \frac{1}{2} \end{pmatrix} =$$

$$M = \begin{pmatrix} \frac{\sqrt{3}}{2} & \frac{1}{2} \\ \frac{1}{2} & -\frac{\sqrt{3}}{2} \\ \frac{\sqrt{3}}{2} & 0 \\ \frac{1}{2} & \frac{\sqrt{3}}{2} \end{pmatrix} \begin{pmatrix} 1 \\ 0 \end{pmatrix} = \begin{pmatrix} \frac{1}{2} \\ -\frac{\sqrt{3}}{2} \end{pmatrix}$$



$$\begin{aligned}
 & P(1,1,1) \\
 & \rightarrow z \\
 & \rightarrow y \\
 & \rightarrow x \\
 & (1,0) = (0,0,1) \\
 & (0,1,0)(0) = \begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 1 \end{pmatrix}
 \end{aligned}$$

$$\begin{aligned}
 M &= \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & -1 \end{pmatrix} \\
 \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & -1 \end{pmatrix} \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix} &= \underline{\begin{pmatrix} 1 \\ 1 \\ -1 \end{pmatrix}}
 \end{aligned}$$