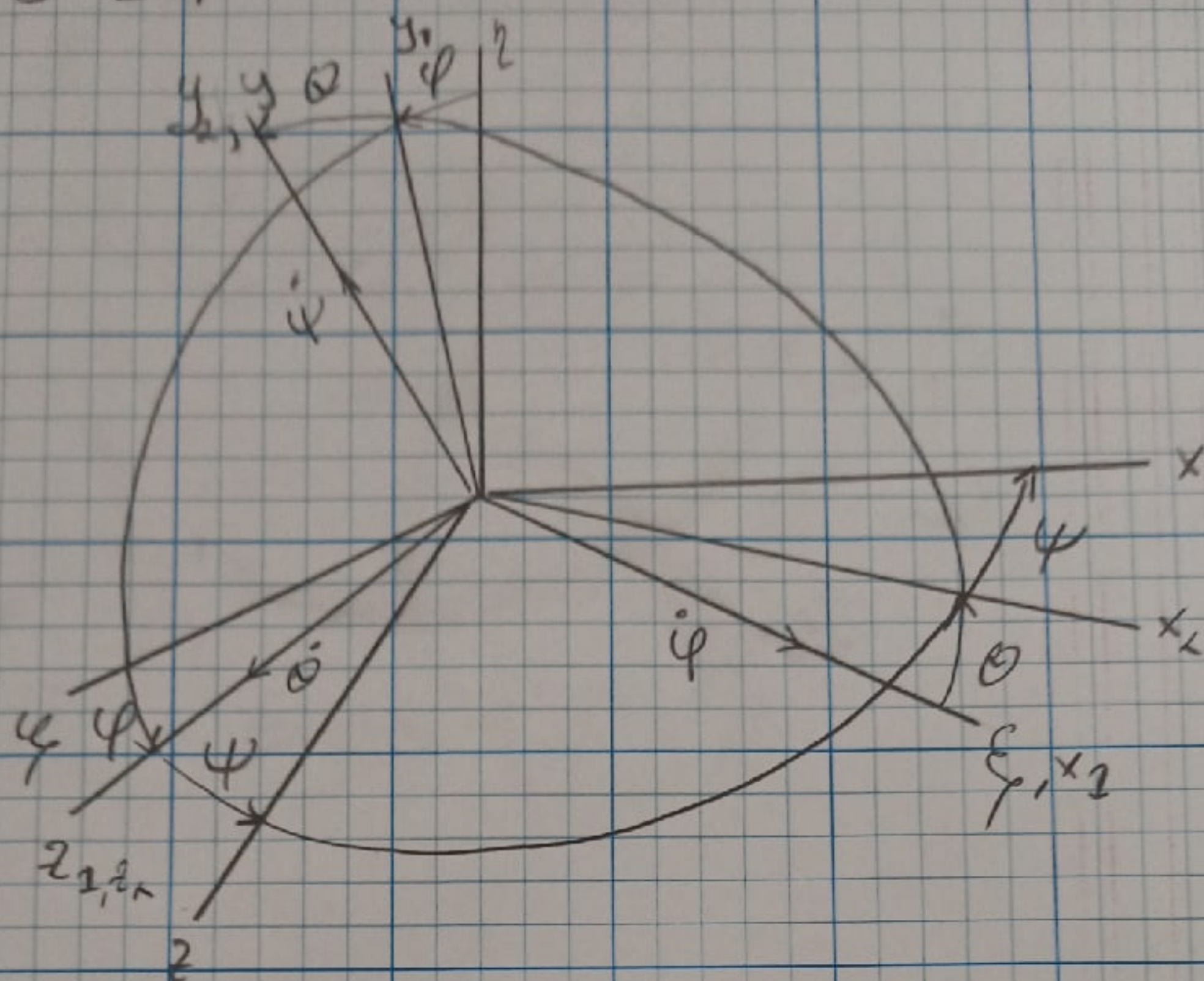
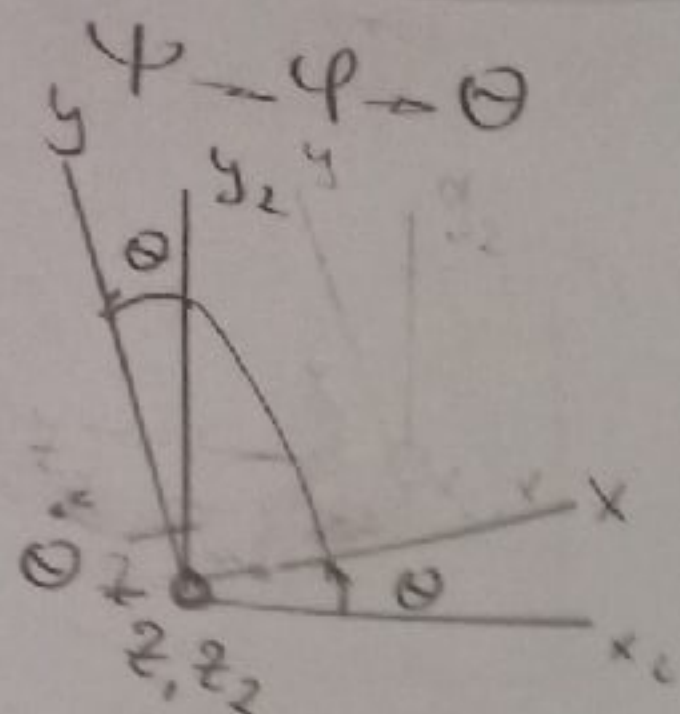






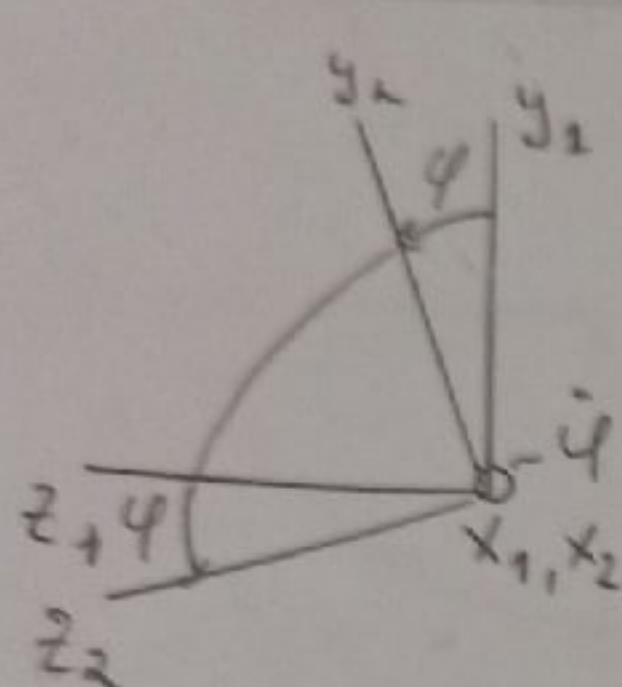
$$6) \varphi \rightarrow \odot \rightarrow \psi$$





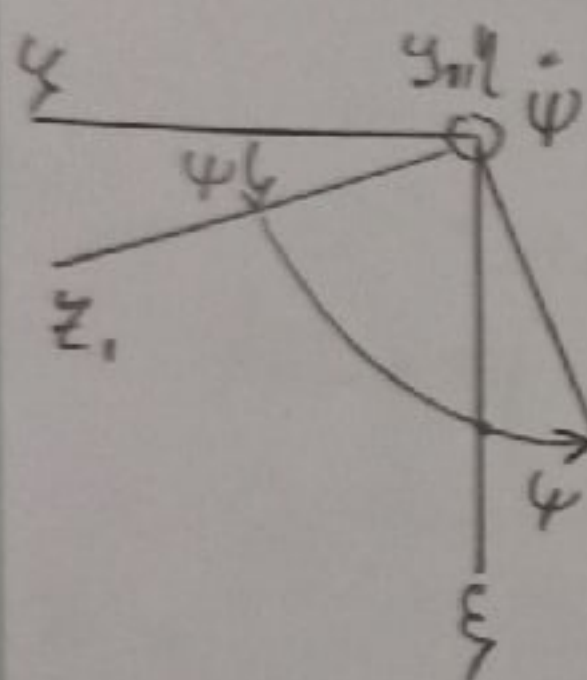
$$\begin{aligned}x_2 &= x \cos \theta - y \sin \theta + 0 \\y_2 &= x \sin \theta + y \cos \theta + 0 \\z_2 &= 0 + 0 + z\end{aligned}$$

$$A_{C \rightarrow 2} = \begin{pmatrix} \cos \theta & -\sin \theta & 0 \\ \sin \theta & \cos \theta & 0 \\ 0 & 0 & 1 \end{pmatrix}$$



$$\begin{aligned}x_1 &= x_2 \cos \phi + 0 + 0; & x_1 &= (x \cos \theta - y \sin \theta) \cos \phi + 0 + 0; \\y_1 &= 0 + y_2 \cos \phi - z_2 \sin \phi; & y_1 &= (x \sin \theta + y \cos \theta) \cos \phi - z \sin \phi; \\z_1 &= 0 + y_2 \sin \phi + z_2 \cos \phi; & z_1 &= 0 + (x \sin \theta + y \cos \theta) \sin \phi + z \cos \phi;\end{aligned}$$

$$A_{C \rightarrow 1} = \begin{pmatrix} 1 & 0 & 0 \\ 0 & \cos \phi & -\sin \phi \\ 0 & \sin \phi & \cos \phi \end{pmatrix} \quad A_{C \rightarrow 1} = \begin{pmatrix} \cos \theta & -\sin \theta & 0 \\ \sin \theta \cos \phi & \cos \theta \cos \phi & -\sin \phi \\ \sin \theta \sin \phi & \cos \theta \sin \phi & \cos \phi \end{pmatrix}$$



$$x_2 = x_1 \cos \psi + 0 + z_1 \sin \psi;$$

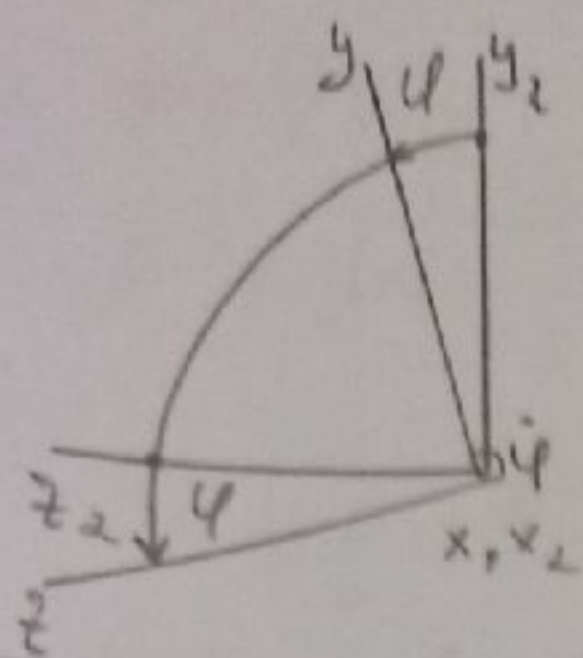
$$y_2 = 0 + 1 y_1 + 0;$$

$$z_2 = -x_1 \sin \psi + 0 + z_1 \cos \psi;$$

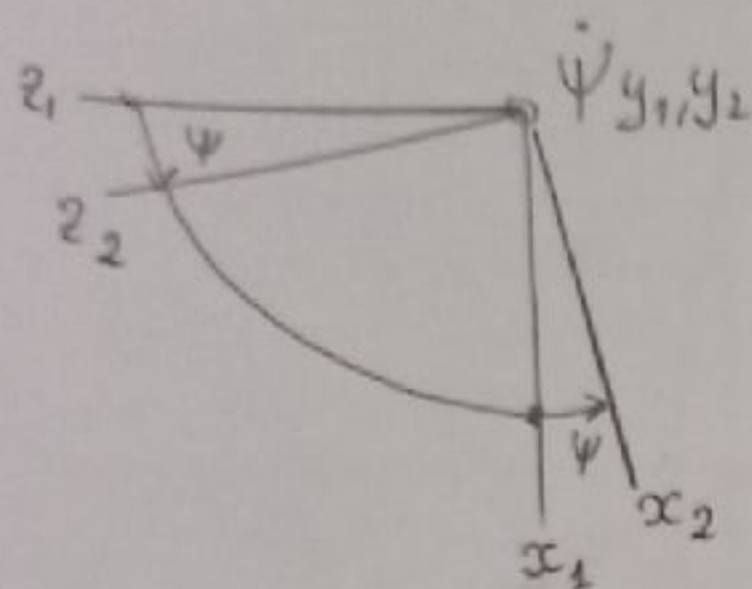
$$\begin{aligned}x_2 &= (x \cos \theta - y \sin \theta) \cos \psi + 0 + (x \sin \theta \sin \phi + y \cos \theta \sin \phi + z \cos \phi) \sin \psi \\y_2 &= 0 + x \sin \theta \cos \phi + y \cos \theta \cos \phi - z \sin \phi \\z_2 &= -(x \cos \theta - y \sin \theta) \sin \psi + 0 + (x \sin \theta \sin \phi + y \cos \theta \sin \phi + z \cos \phi) \cos \psi\end{aligned}$$

$$A_{C \rightarrow 2} = \begin{pmatrix} \cos \theta \cos \psi + \sin \theta \sin \phi \sin \psi & -\sin \theta \cos \psi + \cos \theta \sin \phi \sin \psi & \cos \phi \sin \psi \\ \sin \theta \cos \phi & \cos \theta \cos \phi & -\sin \phi \\ -\cos \theta \sin \psi + \sin \theta \sin \phi \cos \psi & \sin \theta \sin \psi + \cos \theta \sin \phi \cos \psi & \cos \phi \cos \psi \end{pmatrix}$$

①  $\rightarrow \psi \rightarrow \varphi$



$$\begin{aligned} x_2 &= x + 0 + 0; \\ y_2 &= 0 + y \cos \varphi - z \sin \varphi; \\ z_2 &= 0 + y \sin \varphi + z \cos \varphi; \end{aligned} \quad A_{C \rightarrow 2} = \begin{pmatrix} 1 & 0 & 0 \\ 0 & \cos \varphi & -\sin \varphi \\ 0 & \sin \varphi & \cos \varphi \end{pmatrix}$$



$$\begin{aligned} x_1 &= x_2 \cos \psi + 0 + z_2 \sin \psi \\ y_1 &= 0 + y_2 + 0 \\ z_1 &= -x_2 \sin \psi + 0 + z_2 \cos \psi \end{aligned}$$

$$A_{2 \rightarrow 1} = \begin{pmatrix} \cos \psi & 0 & \sin \psi \\ 0 & 1 & 0 \\ -\sin \psi & 0 & \cos \psi \end{pmatrix}$$

$$\begin{aligned} x_1 &= x \cos \psi + 0 + (y \sin \varphi + z \cos \varphi) \sin \psi; \\ y_1 &= 0 + y \cos \varphi - z \sin \varphi; \\ z_1 &= -x \sin \psi + 0 + (y \sin \varphi + z \cos \varphi) \cos \psi \end{aligned}$$

$$A_{C \rightarrow 1} = \begin{pmatrix} \cos \psi & \sin \varphi \sin \psi & \cos \varphi \sin \psi \\ 0 & \cos \varphi & -\sin \varphi \\ -\sin \psi & \sin \varphi \cos \psi & \cos \varphi \cos \psi \end{pmatrix}$$



$$\xi = x_1 \cos \theta - y_1 \sin \theta + 0$$

$$\eta = x_1 \sin \theta + y_1 \cos \theta + 0$$

$$A_{1 \rightarrow \delta} = \begin{pmatrix} \cos \theta & -\sin \theta & 0 \\ \sin \theta & \cos \theta & 0 \\ 0 & 0 & 1 \end{pmatrix}$$

$$\xi = 0 + 0 + z_1$$

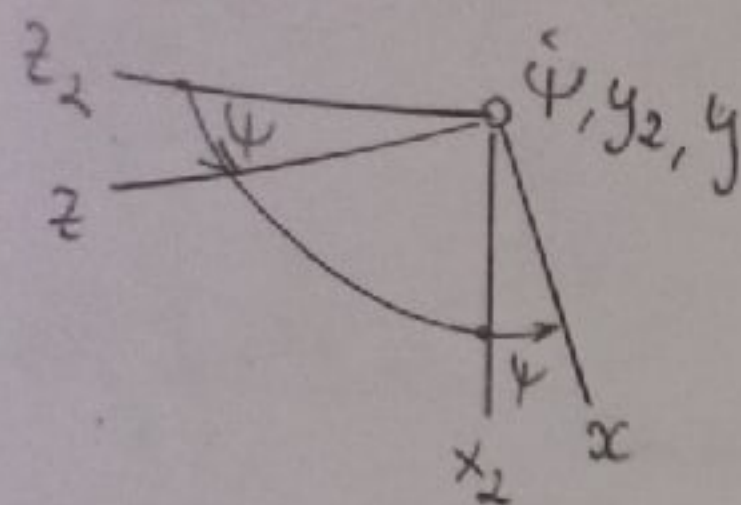
$$\xi = (x \cos \psi + y \sin \varphi \sin \psi + z \cos \varphi \sin \psi) \cos \theta - (0 + y \cos \varphi - z \sin \varphi) \sin \theta$$

$$\eta = (x \cos \psi + y \sin \varphi \sin \psi + z \cos \varphi \sin \psi) \sin \theta + (y \cos \varphi - z \sin \varphi) \cos \theta$$

$$\xi = -x \sin \psi + y \sin \varphi \cos \psi + z \cos \varphi \cos \psi$$

$$A_{C \rightarrow \delta} = \begin{pmatrix} \cos \psi \cos \theta & \sin \varphi \sin \psi \cos \theta - \cos \varphi \sin \theta & \cos \varphi \sin \psi \cos \theta + \sin \varphi \sin \theta \\ \cos \psi \sin \theta & \sin \varphi \cos \psi \sin \theta + \cos \varphi \cos \theta & \cos \varphi \sin \psi \sin \theta - \sin \varphi \cos \theta \\ -\sin \psi & \sin \varphi \cos \psi & \cos \varphi \cos \psi \end{pmatrix}$$

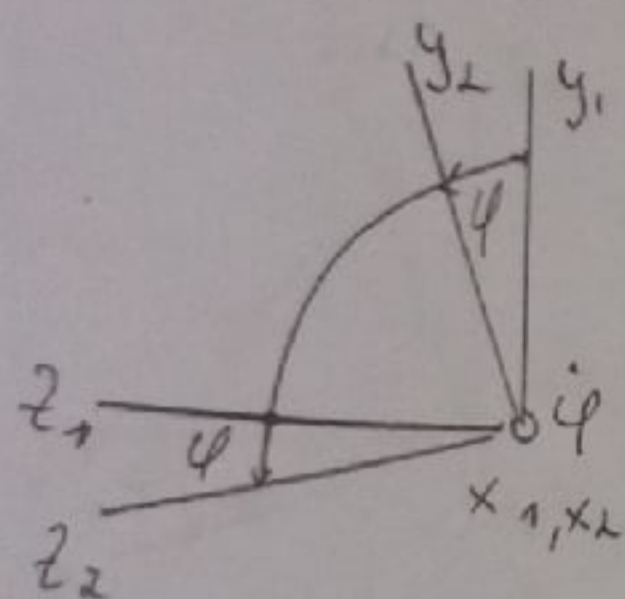
② -  $\psi$  -  $\psi$



$$x_2 = x \cos \psi + 0 + z \sin \psi$$

$$y_2 = 0 + y + 0$$

$$z_2 = -x \sin \psi + 0 + z \cos \psi$$



$$x_1 = x_2 + 0 + 0$$

$$y_1 = y_2 \cos \psi - z_2 \sin \psi$$

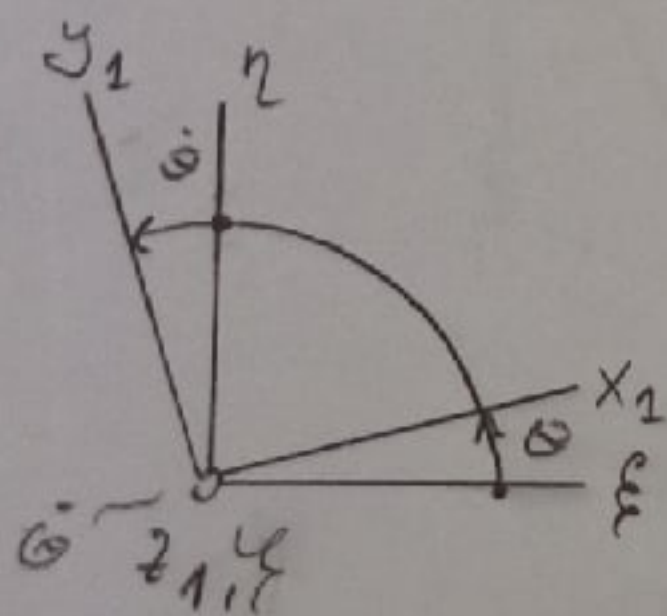
$$z_1 = 0 + y_2 \sin \psi + z_2 \cos \psi$$

$$x_1 = x \cos \psi + 0 + z \sin \psi$$

$$y_1 = y \cos \psi - (-x \sin \psi + z \cos \psi) \sin \psi$$

$$z_1 = y \sin \psi + (-x \sin \psi + z \cos \psi) \cos \psi$$

$$A_{C-2} = \begin{pmatrix} \cos \psi & 0 \\ \sin \psi \sin \psi & \cos \psi \\ -\sin \psi \cos \psi & \sin \psi \\ \sin \psi & \cos \psi \sin \psi \\ \cos \psi \sin \psi & \cos \psi \cos \psi \end{pmatrix}$$



$$\xi = x_2 \cos \theta - y_2 \sin \theta + 0$$

$$\xi = (\cos \psi x + z \sin \psi) \cos \theta - (y \cos \psi - x \sin \psi \sin \psi + z \cos \psi \sin \psi) \sin \theta$$

$$\eta = x_2 \sin \theta + y_2 \cos \theta + 0$$

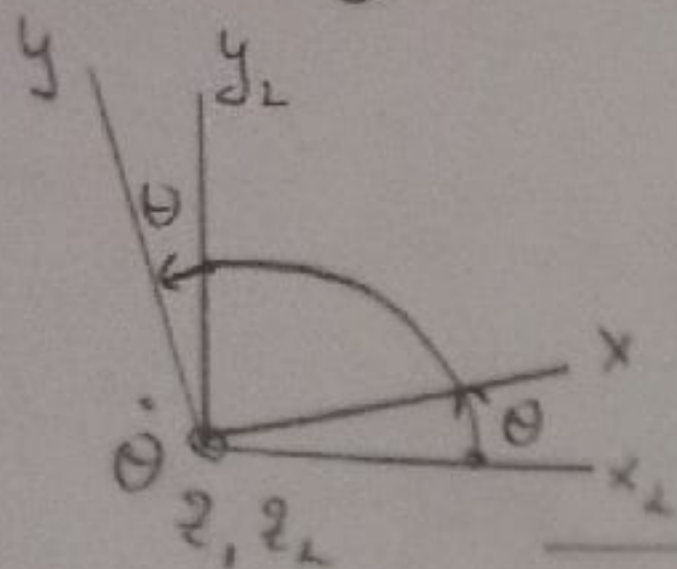
$$\eta = (\cos \psi x + z \sin \psi) \sin \theta + (y \cos \psi - x \sin \psi \sin \psi + z \cos \psi \sin \psi) \cos \theta$$

$$\zeta = 0 + 0 + z_1$$

$$\zeta = y \sin \psi - x \sin \psi \cos \psi + z \cos \psi \cos \psi$$

$$A_{C-5} = \begin{pmatrix} \cos \psi \cos \theta - \sin \psi \sin \psi \sin \theta & -\cos \psi \sin \theta & \sin \psi \cos \theta - \cos \psi \sin \psi \sin \theta \\ \cos \psi \sin \theta + \sin \psi \sin \psi \cos \theta & \cos \psi \cos \theta & \sin \psi \sin \theta + \cos \psi \sin \psi \cos \theta \\ -\sin \psi \cos \psi & \sin \psi & \cos \psi \cos \psi \end{pmatrix}$$

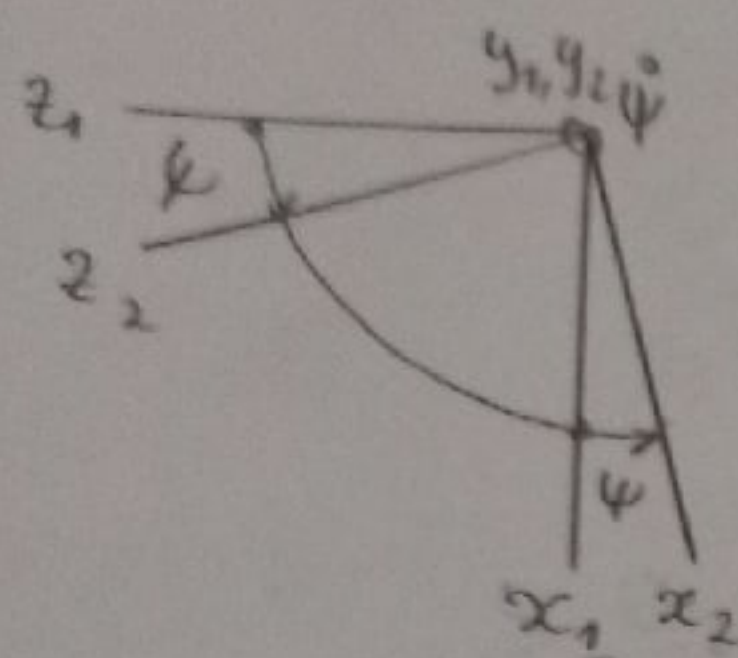
$\psi - \psi - \odot$



$$x_2 = x \cos \theta - y \sin \theta + 0$$

$$y_2 = x \sin \theta + y \cos \theta + 0$$

$$z_2 = 0 + 0 + z$$



$$x_1 = x_2 \cos \psi + 0 + z_2 \sin \psi$$

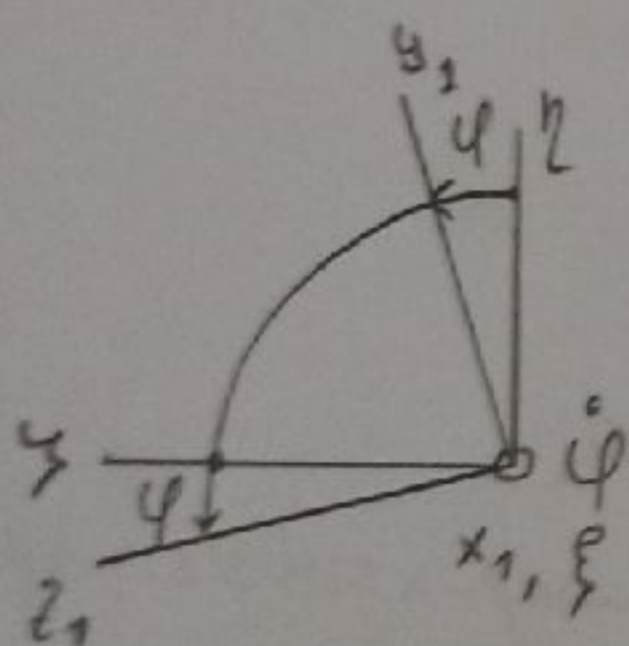
$$y_1 = 0 + y_2 + 0$$

$$z_1 = -x_2 \sin \psi + 0 + z_2 \cos \psi$$

$$x_1 = x \cos \theta \cos \psi - y \sin \theta \cos \psi + z \sin \psi$$

$$y_1 = x \sin \theta + y \cos \theta + 0$$

$$z_1 = -x \cos \theta \sin \psi + y \sin \theta \sin \psi + z \cos \psi$$



$$\xi = x_2 + 0 + 0$$

$$\eta = 0 + y_2 \cos \phi - z_2 \sin \phi$$

$$\zeta = 0 + y_2 \sin \phi + z_2 \cos \phi$$

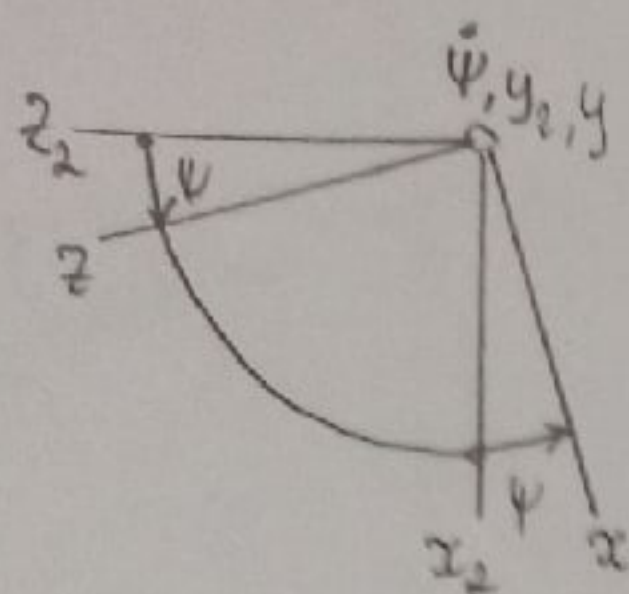
$$\xi = x \cos \theta \cos \psi - y \sin \theta \cos \psi + z \sin \psi$$

$$\eta = x \sin \theta \cos \phi + y \cos \theta \cos \phi - x \cos \theta \sin \psi \sin \phi - y \sin \theta \sin \psi \sin \phi - z \cos \psi \sin \phi$$

$$\zeta = x \sin \theta \sin \phi + y \cos \theta \sin \phi - x \cos \theta \sin \psi \cos \phi + y \sin \theta \sin \psi \cos \phi + z \cos \psi \cos \phi$$

$$A_{c \rightarrow \delta} = \begin{pmatrix} \cos \theta \cos \psi & -\sin \theta \cos \psi & \sin \psi \\ \sin \theta \cos \phi + \cos \theta \sin \psi \sin \phi & \cos \theta \cos \phi - \sin \theta \sin \psi \sin \phi & -\cos \psi \sin \phi \\ \sin \theta \sin \phi - \cos \theta \sin \psi \cos \phi & \cos \theta \sin \phi + \sin \theta \sin \psi \cos \phi & \cos \psi \cos \phi \end{pmatrix}$$

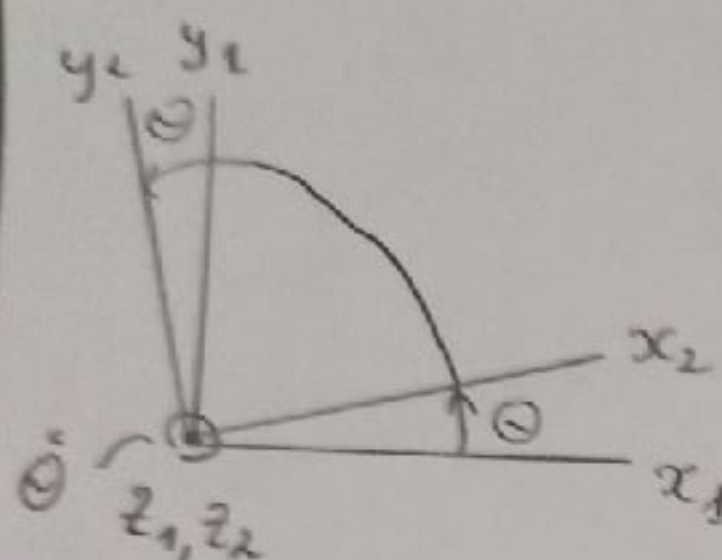
$\psi - \theta - \psi$



$$x_2 = x \cos \psi + 0 + z \sin \psi$$

$$y_2 = 0 + y + 0$$

$$z_2 = -x \sin \psi + 0 + z \cos \psi$$



$$x_2 = x_1 \cos \theta - y_1 \sin \theta + 0$$

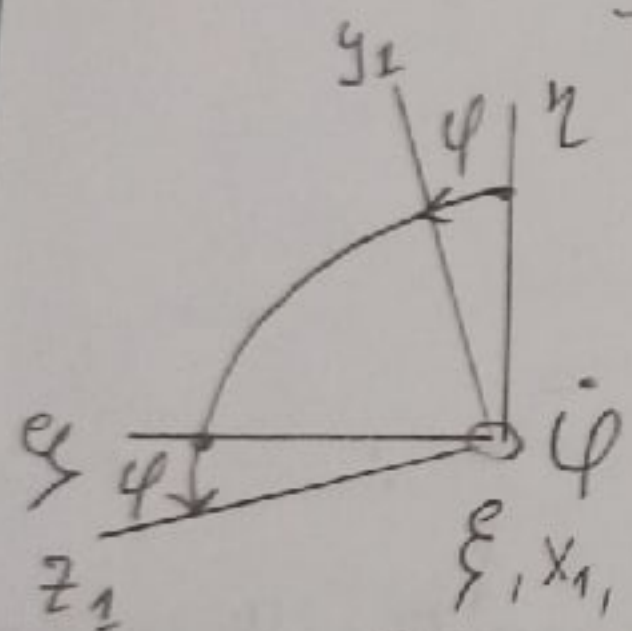
$$y_2 = x_1 \sin \theta + y_1 \cos \theta + 0$$

$$z_2 = 0 + 0 + z_1$$

$$x_1 = x \cos \psi \cos \theta + z \sin \psi \cos \theta - y \sin \theta$$

$$y_1 = x \cos \psi \sin \theta + z \sin \psi \sin \theta + y \cos \theta$$

$$z_1 = -x \sin \psi + z \cos \psi$$



$$\xi = x_1 + 0 + 0$$

$$\eta = y_1 \cos \phi - z_1 \sin \phi$$

$$\zeta = 0 + y_1 \sin \phi + z_1 \cos \phi$$

$$\xi = x \cos \psi \cos \theta - y \sin \theta + z \sin \psi \cos \theta$$

$$\eta = x \cos \psi \sin \theta \cos \phi + y \cos \theta \cos \phi + z \sin \psi \sin \theta \cos \phi - x \sin \psi \sin \phi - z \sin \psi \cos \phi$$

$$\zeta = x \cos \psi \sin \theta \sin \phi + y \cos \theta \sin \phi + z \sin \psi \sin \theta \sin \phi - x \sin \psi \cos \phi + z \cos \psi \cos \phi$$

$$A_{\psi \theta \phi} = \begin{pmatrix} \cos \psi \cos \theta & -\sin \theta & \sin \psi \cos \theta \\ \sin \theta \cos \psi \cos \phi - \sin \psi \sin \phi & \cos \theta \cos \phi & \sin \psi \sin \theta \cos \phi - \sin \phi \cos \psi \\ \cos \psi \sin \theta \sin \phi - \sin \psi \cos \phi & \cos \theta \sin \phi & \sin \psi \sin \theta \sin \phi + \cos \phi \cos \psi \end{pmatrix}$$