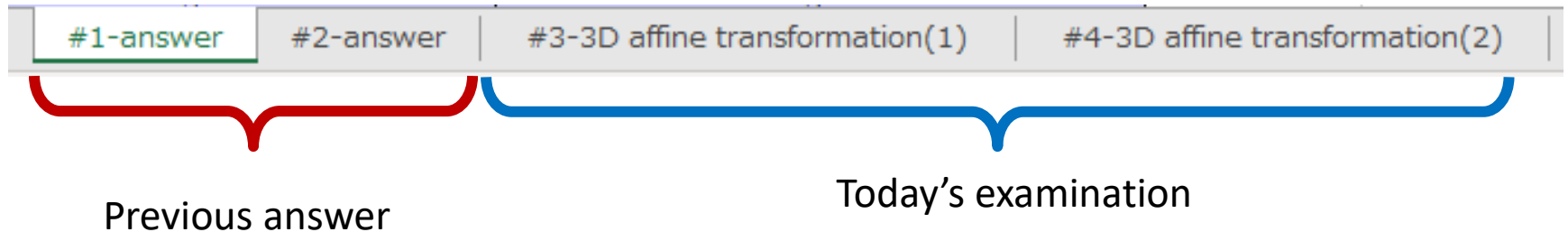


# Handle 3D coordinates of CT Practice with DICOM and ImageJ Part.2

Determine the reference plane  
by measuring 3 points

# Previous answer

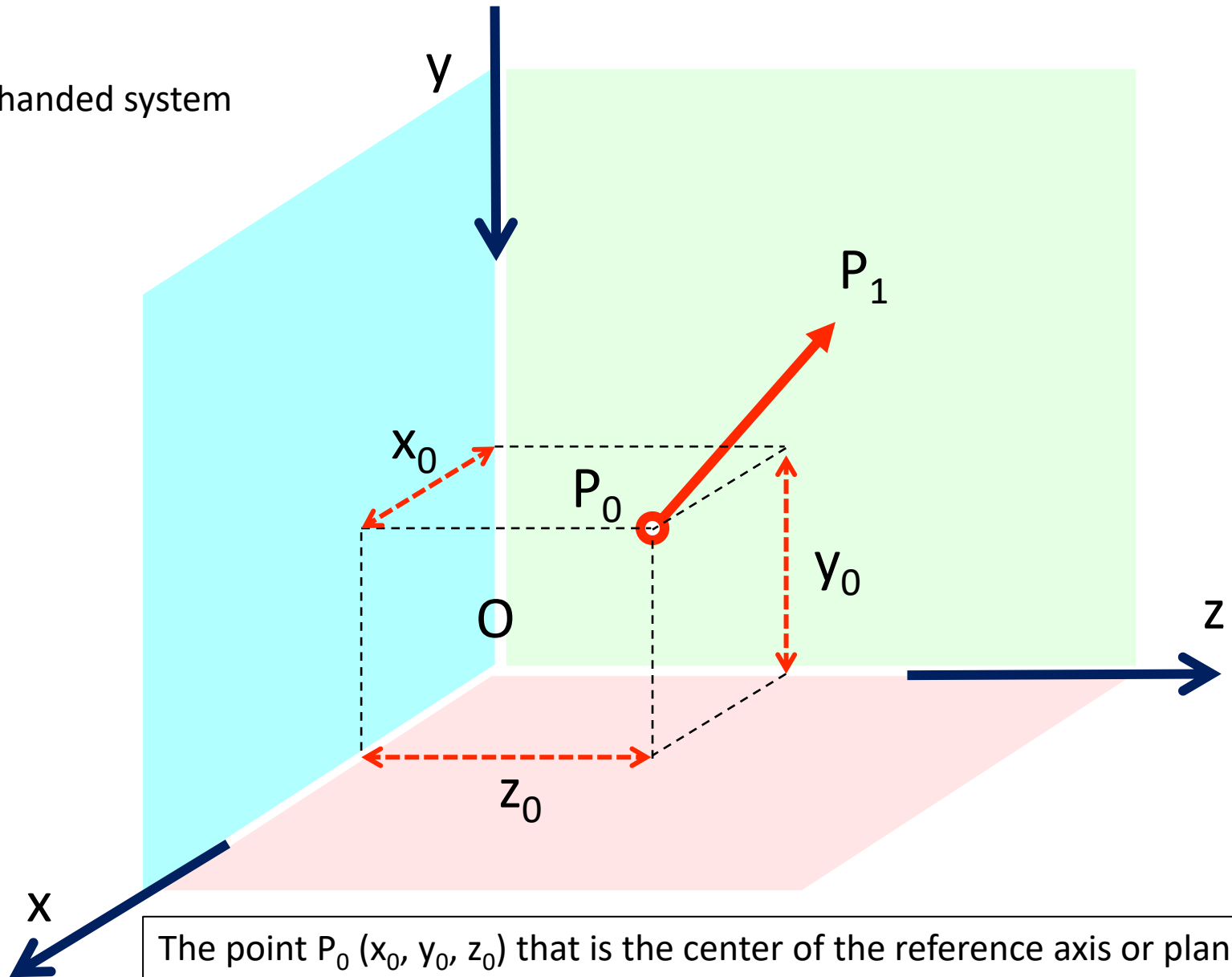
- Please refer following two sheets in today's excel file.
  - #1-answer
  - #2-answer



# #3 & #4: 3D affine transformation

- Exercise 3: Parallel Translation and Rotation of Coordinates
- Exercise 4: The Last Step to 3D Affine Transformation

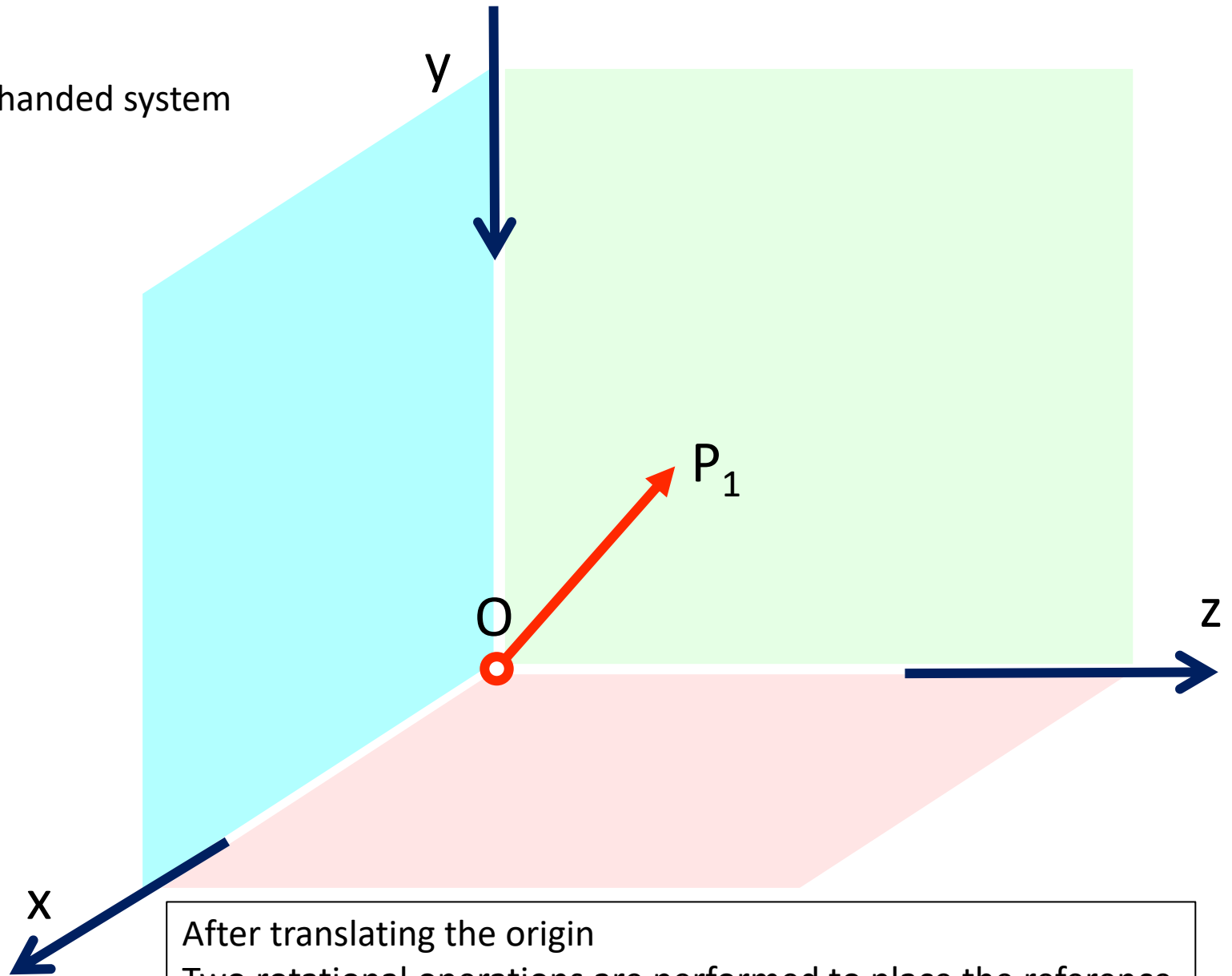
Right-handed system



The point  $P_0 (x_0, y_0, z_0)$  that is the center of the reference axis or plane is converted to the origin  $O (0, 0, 0)$ .

\*\* This time  $P_0$  is the midpoint between point  $a$  and  $b$ .

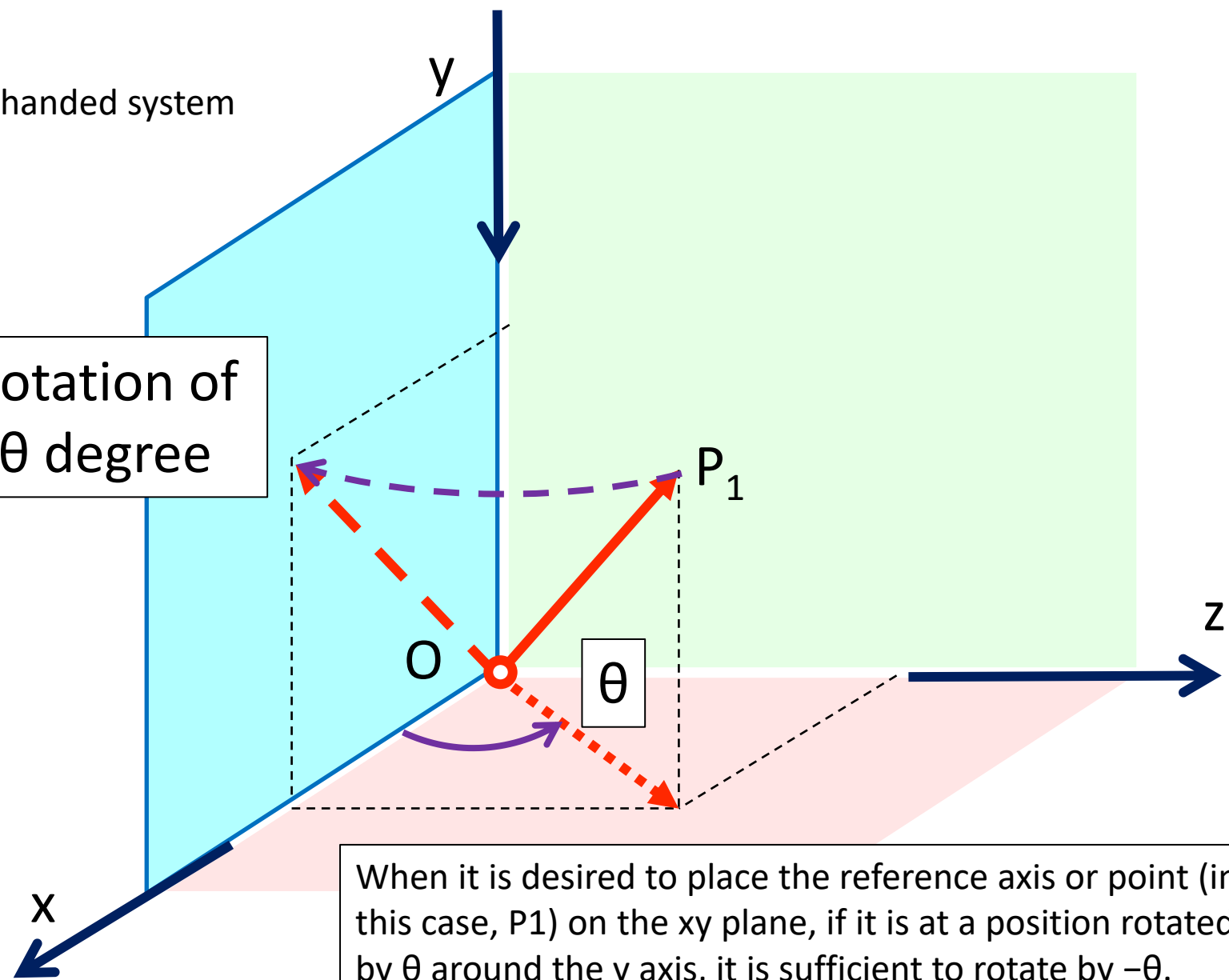
Right-handed system



After translating the origin  
Two rotational operations are performed to place the reference axis or reference point (e.g., the right polygon in this figure,  $P_1$ ) on the  $x$ -axis.

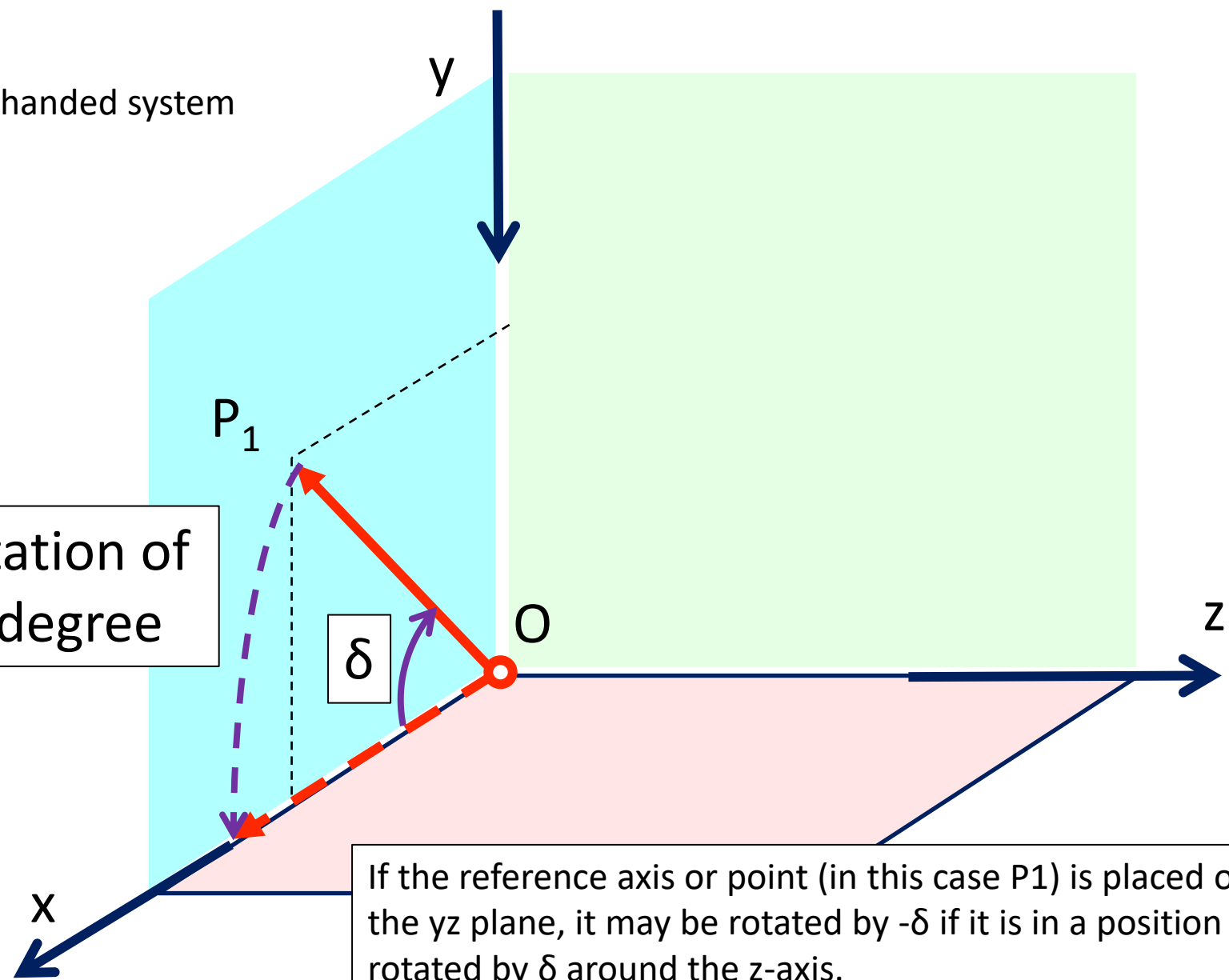
Right-handed system

Rotation of  $-\theta$  degree



When it is desired to place the reference axis or point (in this case, P1) on the xy plane, if it is at a position rotated by  $\theta$  around the y axis, it is sufficient to rotate by  $-\theta$ . The rotation angle may be set to  $\theta = \text{atan}(\Delta z / \Delta x)$  using the value of x ( $\Delta x$ ) and the value of z ( $\Delta z$ ) of P1.

Right-handed system

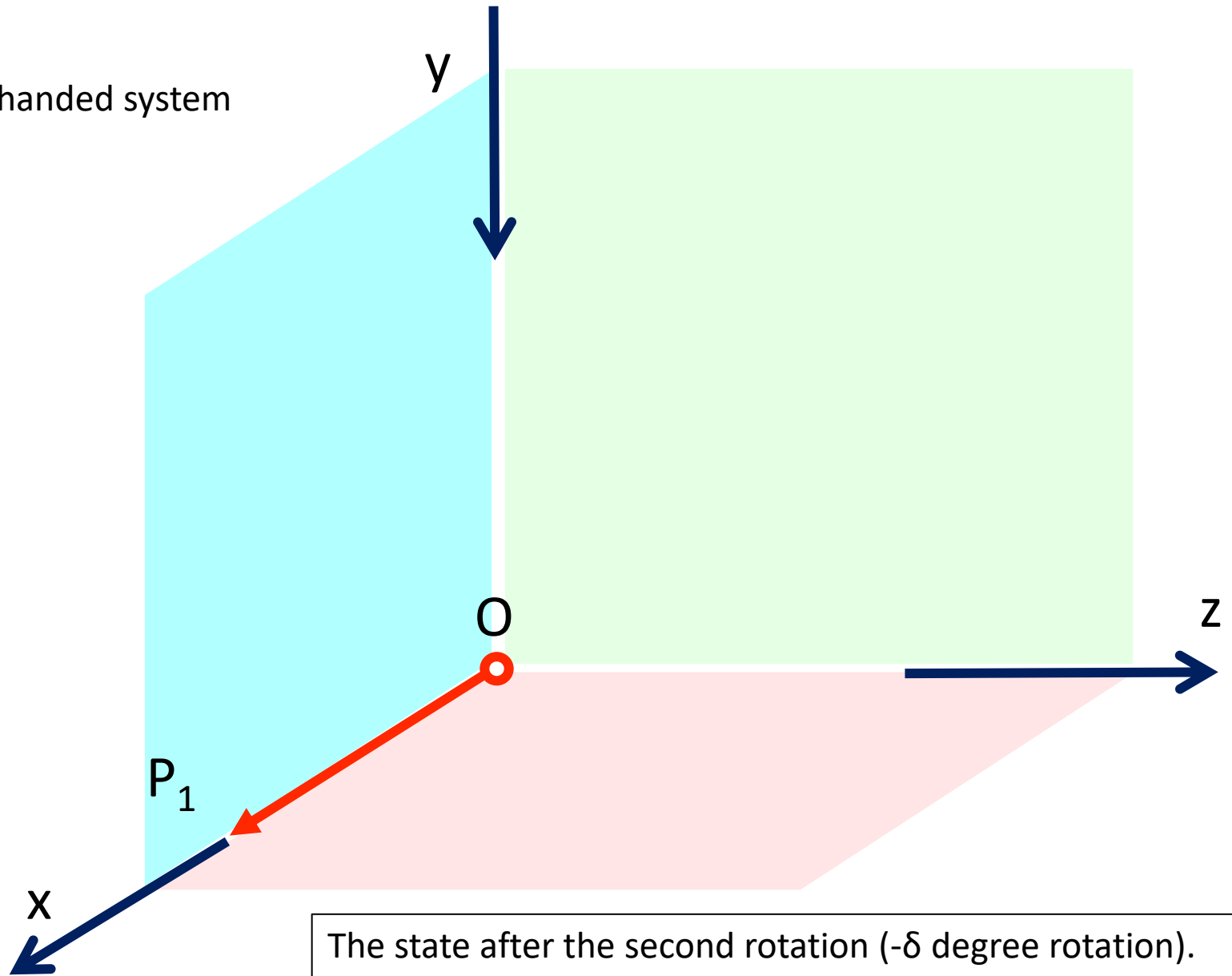


Rotation of  $-\delta$  degree

$\delta$

If the reference axis or point (in this case  $P_1$ ) is placed on the  $yz$  plane, it may be rotated by  $-\delta$  if it is in a position rotated by  $\delta$  around the  $z$ -axis. The reference axis (reference point) is placed on the  $x$ -axis in the two rotations.

Right-handed system



The state after the second rotation ( $-\delta$  degree rotation).  
The reference axis (reference point) is placed on the X axis  
in two rotations.