

Instruction: Hand in this homework via email only.

Member:

1. Name: _____ Code: _____

Questions:

1. Let P be a point whose coordinates are $p = \left(\frac{1}{\sqrt{3}}, -\frac{1}{\sqrt{6}}, \frac{1}{\sqrt{2}} \right)$ with respect to the fixed frame $\hat{x}_a - \hat{y}_a - \hat{z}$. Suppose that P is rotated about the fixed-frame \hat{x} -axis by 30 degrees, then about the fixed-frame \hat{y} -axis by 135 degrees, and finally about the fixed-frame \hat{z} -axis by -120 degrees. Denote the coordinates of this newly rotated point by p' .
 - (a) What are the coordinates p' ?
 - (b) Find the rotating matrix R such that $p' = Rp$ for the p' you obtained in (a).

2. Suppose that $p_i \in \mathbb{R}^3$ and $p'_i \in \mathbb{R}^3$ are related by $p'_i = Rp_i$, $i = 1, 2, 3$, for some unknown rotation matrix R . Find, if it exists, the rotation R for the three input-output pairs $p_i \mapsto p'_i$, where

$$\begin{aligned} p_1 = (\sqrt{2}, 0, 2) &\mapsto p'_1 = (0, 2, \sqrt{2}) \\ p_2 = (1, 1, -1) &\mapsto p'_2 = \left(\frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}}, -\sqrt{2}\right) \\ p_3 = (0, 2\sqrt{2}, 0) &\mapsto p'_3 = (-\sqrt{2}, \sqrt{2}, -2) \end{aligned}$$