

Name: Answer Key

PID:

1. These questions concern composition of the transformations $R_{\pi/3, -\mathbf{k}}$ and T_i . (Note the minus sign on the “ $-\mathbf{k}$ ” in the subscript.)

(a) Give the 4×4 matrix that represents $T_i \circ R_{\pi/3, -\mathbf{k}}$ over homogeneous coordinates.

$$\begin{pmatrix} 1/2 & \sqrt{3}/2 & 0 & 1 \\ -\sqrt{3}/2 & 1/2 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}$$

$$T_i(R_{\pi/3, -\mathbf{k}}(\vec{0})) = \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix}$$

$R_{\pi/3, -\vec{k}}$ is the same

$$\text{as } R_{-\pi/3, \vec{k}}.$$

(b) Give the 4×4 matrix that represents $R_{\pi/3, -\mathbf{k}} \circ T_i$ over homogeneous coordinates.

$$\begin{pmatrix} 1/2 & \sqrt{3}/2 & 0 & 1/2 \\ -\sqrt{3}/2 & 1/2 & 0 & -\sqrt{3}/2 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}$$

$$R_{\pi/3, -\vec{k}}(\langle 1, 0, 0 \rangle) = \langle 1/2, -\sqrt{3}/2, 0 \rangle$$

so

$$R_{\pi/3, -\vec{k}}(T_i(\vec{0})) = \langle 1/2, -\sqrt{3}/2, 0 \rangle.$$