

CS 435: Homework 1

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Part 1 -

Question 1

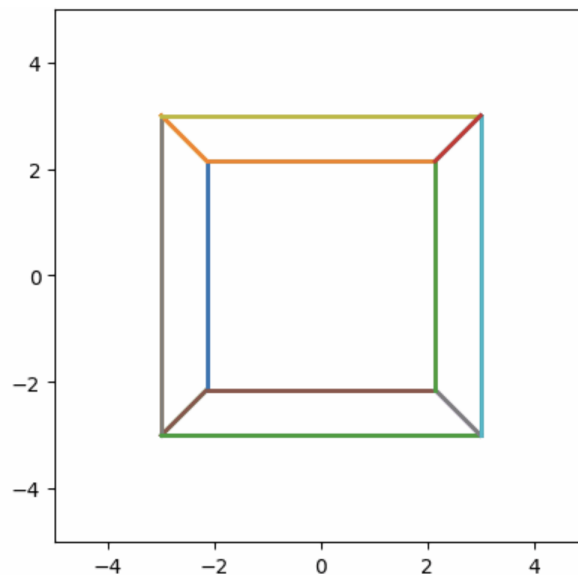


Figure 1: GIF displayed as a static image.

Question 2

No, 3D rotation matrices are not commutative in general. The final orientation of the rotated cube depends on the order in which the rotations are applied. Rotating about x first and then y produces a different result than rotating about y first and then x .

Below are the screenshots showing the different results of applying the rotations in different orders:

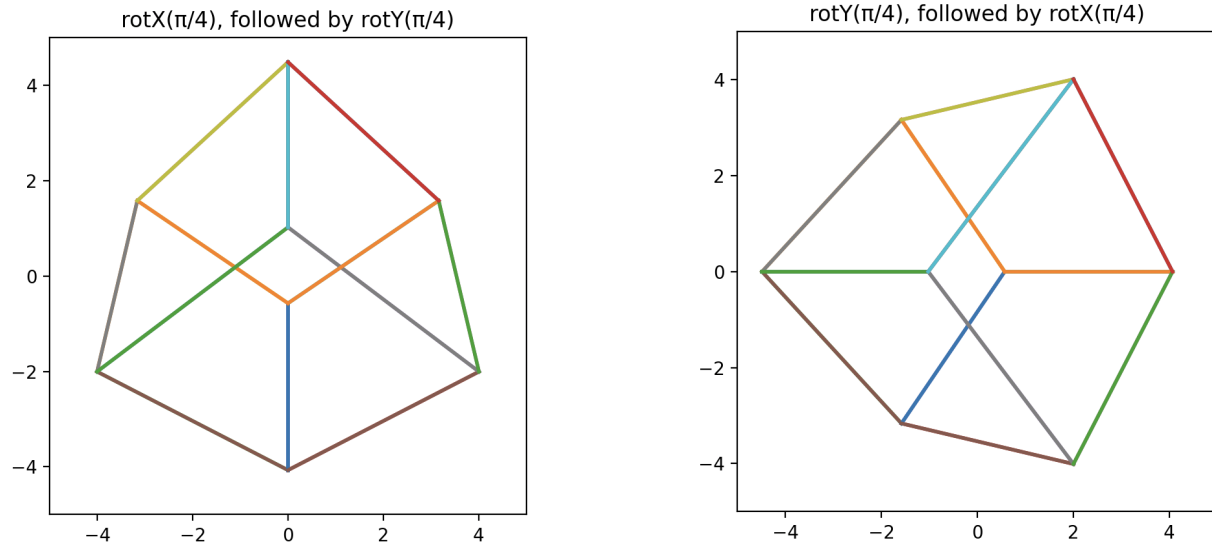
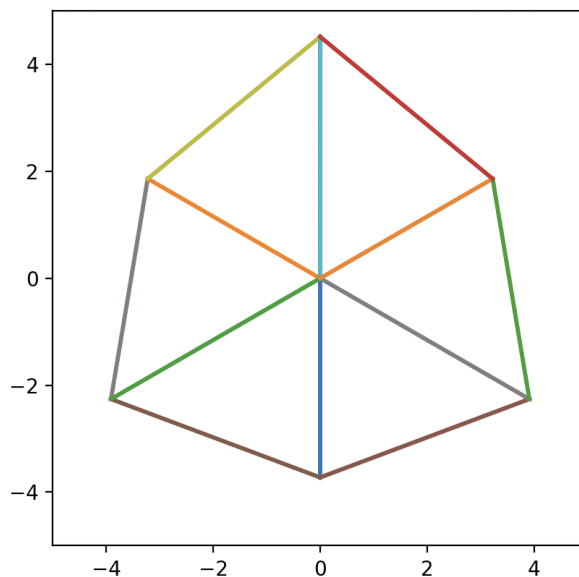


Figure 2: Left: Rotation about x first, then y . Right: Rotation about y first, then x .

Question 3

The chosen order of rotations is first about the x -axis, followed by the y -axis. The parameters are:

```
R_diagonal = rotX(np.arctan(1 / np.sqrt(2))) @ rotY(np.pi / 4)
```



Question 4

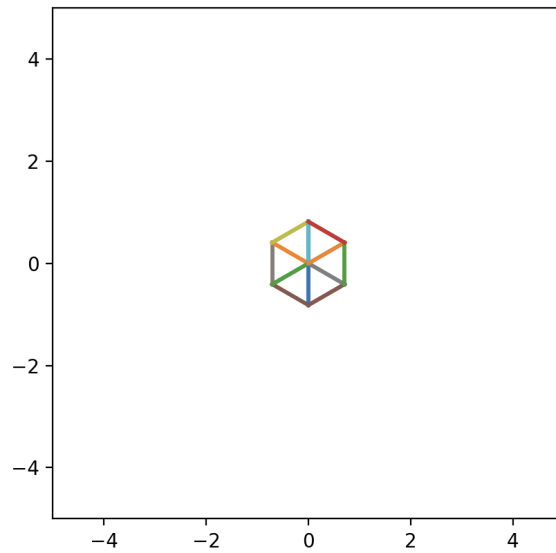


Figure 3: Orthographic

Part 2 -

Question 1



Figure 4: Outdoor RGB



Figure 5: Indoor RGB

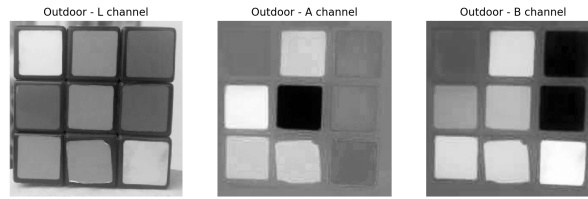


Figure 6: Outdoor LAB

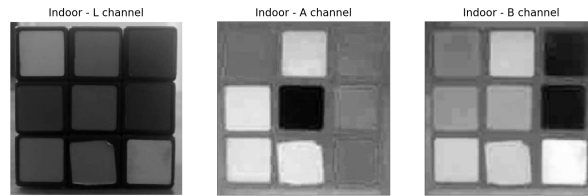


Figure 7: Indoor LAB

Question 2

In the LAB color space, the L channel mostly captures how bright or dark the scene is, while the A and B channels carry the color information. This means that when lighting changes, you can see most of that difference reflected in the L channel, making it easier to separate brightness changes from the actual colors of the object. In contrast, the RGB channels mix brightness and color together, so a change in illumination can affect *all* of R, G, and B in a more tangled way.

Question 3

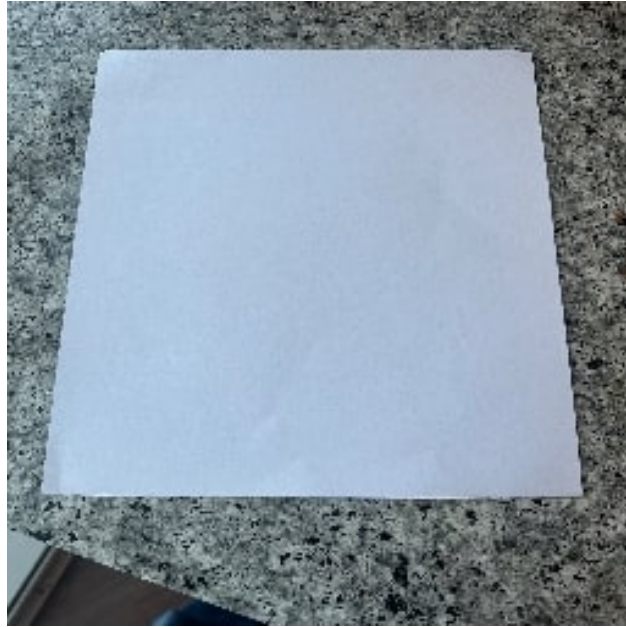


Figure 8: My Object in Natural Light



Figure 9: My Object in Artificial Light

Note: Line 1 and Line 2 added in the *info.txt* file within the same folder.