

These questions relate to lecture material and aim to highlight the most important concepts. We will cover questions similar to these for our midterm

1. How do we compute the 3x3 rotation matrix for euler angles ZYX?

2. Derive the inverse of a ZYX euler matrix.

3. An object is subjected to the following transformations. Assume initially aligned with frame 0.

- a. Rotated of 90 degrees about its local z-axis (frame 1)
- b. Rotated 90 degrees about its local x-axis (frame 2)
- c. Translated $(1,2,3)^T$ (frame 3)

Compute the transformation matrices that convert between each frame. What are the coordinates of a point in frame 3 with respect to frame 0?

4. What is Gimbal lock? When does it occur?

5. Suppose we want to rotate a point $(3,0,0)$ around the axis $(1,1,0)$ by 30 degrees. Using a quaternion, compute the rotation.

6. When converting from a matrix back into a quaternion, verify that

$$x^2 = \frac{1}{4} * (1 + r_{11} - r_{22} - r_{33})$$