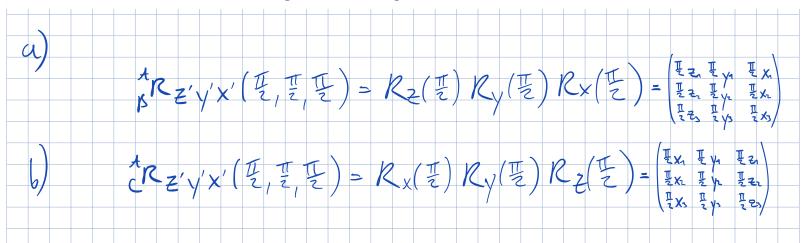
Assignment 5-1: Euler Angle Rotations (2 Points)

- (a) (1 Point) Given is a coordinate frame $\{A\}$. The coordinate frame $\{B\}$ is created from $\{A\}$ via rotation around the z-axis by $\frac{\pi}{2}$, then intrinsic rotation around the y-axis by $\frac{\pi}{2}$ and intrinsic rotation around the x-axis by $\frac{\pi}{2}$. Write down the whole formula (with all rotation matrices in the right order) to calculate $\frac{A}{B}R$. Calculate $\frac{A}{B}R$.
- (b) (1 Point) Given is a coordinate frame $\{A\}$. The coordinate frame $\{C\}$ is created from $\{A\}$ via rotation around the z-axis by $\frac{\pi}{2}$, then extrinsic rotation around the y-axis by $\frac{\pi}{2}$ and extrinsic rotation around the x-axis by $\frac{\pi}{2}$. Write down the whole formula (with all rotation matrices in the right order) to calculate ${}_C^A R$. Calculate ${}_C^A R$.



Assignment 5-2: Rodrigues Rotations (3 Points)

Given is the axis-angle rotation vector $\Theta = (2, 2, 0)$.

- (a) (0.5 Points) Calculate the unit vector of the rotation axis k and the angle θ
- (b) (1.5 Points) Derive the rotation matrix R representing the same rotation, using the exponential map, and show, that your matrix is orthogonal.
- (c) (1 Point) Given a vector $P_A = (1, 2, 3)$ Rotate Vector P_A by Θ using Rodrigues' formula

Provide calculation steps for each of the above tasks.

$$A = \begin{bmatrix} 7 \\ 6 \end{bmatrix}$$

$$A = \begin{bmatrix} 6 \\ 0 \\ -1 \end{bmatrix}$$

$$A = \begin{bmatrix} 6 \\ 0 \\ -1 \end{bmatrix}$$

$$A = \begin{bmatrix} 7 \\ 1 \end{bmatrix}$$

$$A$$

