

✔ Congratulations! You passed!

Grade received 83.33% To pass 80% or higher

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1. Our representation of the three-dimensional orientation uses an implicit representation (a 3×3 $SO(3)$ matrix with 9 numbers), but our usual representation of the angular velocity uses only three numbers, i.e., an explicit parametrization of the three-dimensional velocity space. Why do we use an implicit representation of the orientation but an explicit parametrization of the angular velocity? 1 / 1 point

- ☐ There is no natural implicit representation of an angular velocity.
- ☒ The space of angular velocities can be equated to a "flat" 3d space (a linear vector space) tangent to the curved 3d surface of orientations at any given time, so it can be globally represented by 3 numbers without singularities. The space of orientations, on the other hand, is not flat, and cannot be globally represented by 3 numbers without a singularity.

✔ Correct

2. A rotation matrix is an element of which space? 1 / 1 point

- ☐ \mathbb{R}^3
- ☒ $SO(3)$
- ☐ $so(3)$

✔ Correct

3. An angular velocity is an element of which space? 1 / 1 point

- ☒ \mathbb{R}^3
- ☐ $SO(3)$
- ☐ $so(3)$

✔ Correct

4. The 3×3 skew-symmetric matrix representation of an angular velocity is an element of which space? 0 / 1 point

- ☐ \mathbb{R}^3
- ☒ $SO(3)$
- ☐ $so(3)$

✘ Incorrect

5. If an angular velocity is represented as ω_b in the body frame $\{b\}$, what is the representation of the same angular velocity in the space frame $\{s\}$? 1 / 1 point

- ☒ $R_{sb}\omega_b$
- ☐ $R_{bs}\omega_b$
- ☐ $\omega_b R_{sb}$
- ☐ $\omega_b R_{bs}$

✔ Correct
This is correct by the subscript cancellation rule.

6. The cross-product $\omega \times p$ can be written $[\omega]p$, where $[\omega]$ is 1 / 1 point

- ☐ the $SO(3)$ representation of ω .
- ☒ the skew-symmetric $so(3)$ representation of ω .

✔ Correct
The 3×3 skew-symmetric matrix representation of a 3-vector allows calculating a cross product using matrix multiplication.